# MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

VOL. 67, No. 10
W. B. No. 1279

OCTOBER 1939

CLOSED DEC. 4, 1939
ISSUED January 25, 1940


## HAIL AND WINDSTORM OVER SOUTHEASTERN LOUISIANA, FEBRUARY 26, 1939


By G. L. CANADAY
[Weather Bureau, New Orleans, La., March 1939]


A hail and wind storm originated over north-central Lafourche Parish, La., at 10:45 p. m. on February 26, 1939; light hail was first reported at Lafourche and Lockport at that time.

The storm moved east-northeastward, with an average speed of about 50 miles per hour, traversing a path 65 miles long in 1 hour and 15 minutes. The path of falling hail varied in width from about 16 miles at its beginning to about 27 miles at its widest part over New Orleans and adjacent territory. The storm started from just east of Thibodaux about 10:45 p. m. and moved to New Orleans by 11:30 to 11:40 p. m.; it reached Violet at 12 midnight,

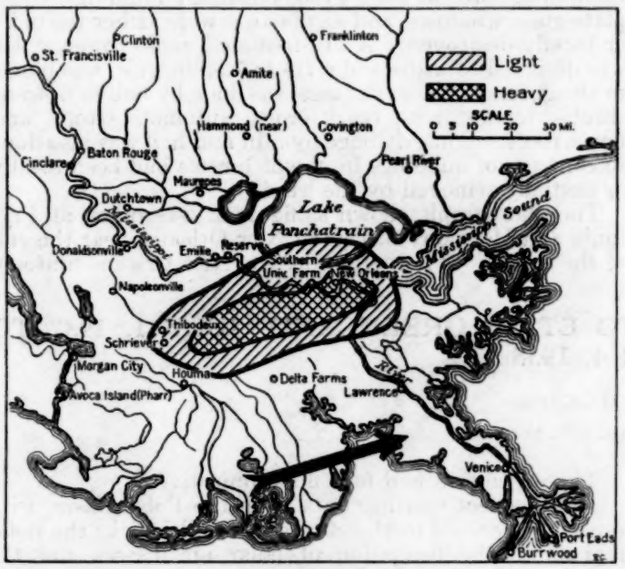


FIGURE 1.—Approximate path and intensity of hailstorm of February 26-27, 1939, at New Orleans, La.

after which it was lost to record over Lake Borgne. Hail was recorded at the Weather Bureau, New Orleans, from 11:30 to 11:40 p. m., during which time it was principally heavy. Rain began at 11:25 p. m., continued during the hail, and ended 10 minutes past midnight. The total measurement of rain and melted hail was 0.68 inch for the 45-minute period.

Heavy hail occurred along a fairly uniform strip about 10 miles wide and 50 miles long in the middle of the storm path.

The approximate path and the intensity of the hailstorm are indicated in figure 1.

Hailstones varied in size from one-fourth to three-fourths inch in diameter in New Orleans; stones nearly 3 inches in diameter were reported from the vicinity of Arabi, St. Bernard Parish, and Westwego, Jefferson Parish, and some as small as one-eighth inch in a few areas.

The hail reached an accumulated depth of 1 inch at the Weather Bureau in New Orleans and from 1 to 2 inches elsewhere in the city, and piled up as deep as 1 foot in corners and along edges of buildings. Hail was observed to remain on roofs and on the ground in some sections until 4 p. m. of the 27th even though the temperature at the

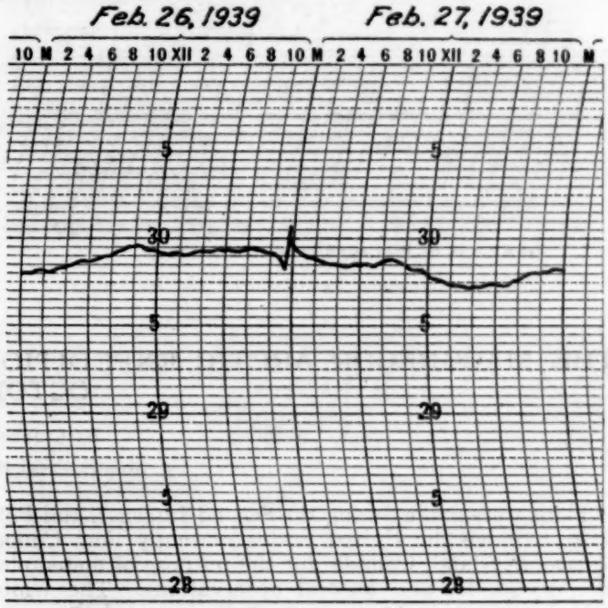


FIGURE 2.—Barogram, New Orleans, La., February 26-27, 1939.

Weather Bureau, New Orleans, rose from 48° at midnight to 74° in the afternoon.

A copy of the Weather Bureau, New Orleans, barograph trace is shown in figure 2. The barometric pressure fell slightly just prior to the storm, then rose rapidly about 0.25 inch. It then dropped sharply for a few minutes and afterward more slowly until it returned to normal near 1 a. m.

In figure 3 the temperature changes accompanying the storm are indicated. There was a slow rise from 54° at 10 p. m. to 57° at 11:30 p. m. When the hail began at 11:30 p. m., there was a decided drop from 57° to 48° by midnight.

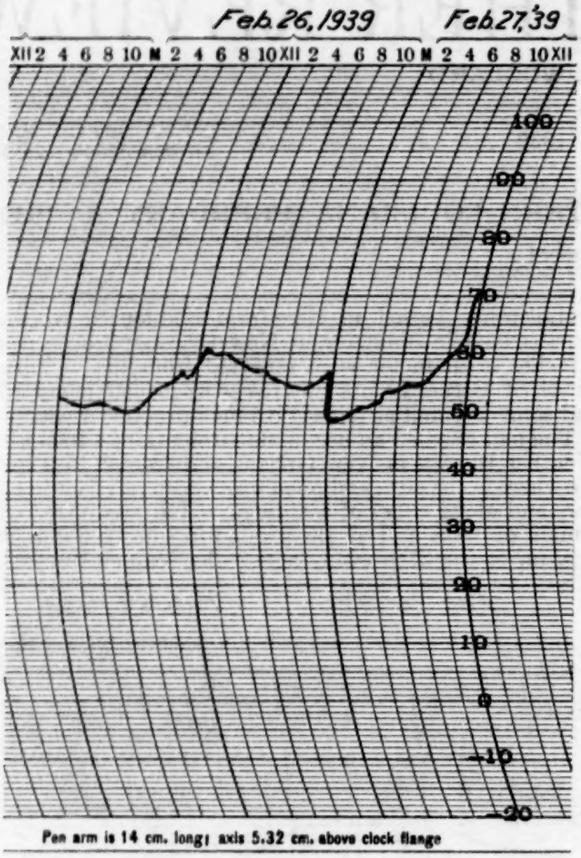


FIGURE 3.—Thermogram, New Orleans, La., February 26-27, 1939.

Maximum wind velocities varied considerably over the path of the storm and at most places were quite gusty, lasting only a very few minutes generally, and wind directions, for the most part, made very rapid shifts. However, little tornadic tendency was noted. The wind direction at the Weather Bureau, New Orleans, was easterly at the beginning of the hail, 11:30 p. m., but shifted to west and southwest at 11:39 and remained from that quadrant for 5 minutes, then shifted to easterly for 3 minutes, again to westerly for 4 minutes and at 11:52 returned to easterly.

The maximum 5-minute velocity recorded at New Orleans was 25 miles per hour from the southwest at 11:40 p. m., during which time an extreme velocity of 32 miles per hour occurred. Much higher extreme and maximum 5-minute velocities evidently occurred in some other sections of the storm area. A 90-mile gust (uncorrected) was recorded by the anemometer atop the Huey P. Long bridge across the Mississippi River, a short distance upstream from New Orleans, at an elevation of 265 feet above sea level.

Damage in the storm area, outside of the city of New Orleans, from both hail and wind, is estimated to be $50,000, consisting chiefly in loss of crops, buildings, and trees. In and around New Orleans it is estimated that the damage was at least $150,000; many buildings, trees, plate-glass windows, and signboards were either partially or totally destroyed. A 210-foot steel radio tower which was designed to withstand a 70- to 75-mile gale, was blown to the ground. Most damage was done by hail to flowers, shrubs, tender trees, truck crops, automobile tops, and house roofs. Some damage by rain and hail was also done to contents of buildings from which roofs had been totally or pratially removed by the wind.

The photograph, shown as figure 4, was taken at Prytania and Harmony Streets in New Orleans, near the end of the storm. (Photograph by the New Orleans States.)

## THE MACGREGOR ARCTIC EXPEDITION TO ETAH, GREENLAND, JULY 1, 1937 TO OCTOBER 4, 1938

By CLIFFORD J. MACGREGOR

[Weather Bureau, Horseheads, N. Y., March 1939]

Plans were made during the Second International Polar Year to have the United States reoccupy Fort Conger, Ellesmere Island, Canada, for the purpose of meteorological, magnetic, and auroral observations. The United States was unable, however, to carry out the full program outlined by the Commission, and therefore no station was in operation in Ellesmereland or North Greenland, leaving a large blank area on the charts. During the writer's stay at Point Barrow, Alaska, for the Polar Year, he decided to reoccupy Fort Conger as soon as the necessary arrangements could be made; and in the fall of 1936 the organization of this trip became possible.

In the spring of 1937 a three-masted schooner, well constructed for use in the polar ice, was purchased in Newfoundland, and brought to Port Newark, N. J., where new motors were installed, and the ship reconditioned for the expedition, with new lines, rigging, sails, cabins, and internal bracing.

Leave of absence was obtained from the United States Weather Bureau for the purpose of leading the expedition. Personnel was secured for the special work to be done, such as magnetic and airplane surveying, making a total of 10 members.

The expedition had four main objectives:

1. To collect weather data from the Polar Basin, with especial reference to the effects of conditions in the polar regions to the formation of polar air masses and the weather of lower latitudes.

2. To make a magnetic survey for the Carnegie Institution of Washington.

3. To photograph the aurora borealis and study its effects upon radio transmission.

4. To explore the Polar Basin northwest of Ellesmereland, Canada, in order to clear up the question of Crocker Land which Peary placed on the maps more than 30 years ago and which we found to be nonexistent. At the same time a study was made of the customs and mode of life of the Polar Eskimo, and of the wildlife.

The United States Weather Bureau, the Julian P. Friez Co., and the Weston Electrical Co. supplied the necessary meteorological instruments, and the American Oxygen Co. of Harrison, N. J., provided the hydrogen for inflating the balloons. The Monroe Calculator Co. loaned an adding machine; and most of the records were compiled in the field. Electric current was supplied by Exide batteries, kept charged by small windchargers.

## NARRATIVE

The expedition set sail from Port Newark, N. J., on July 1, 1937, for Lunenburg, Nova Scotia, where a week was spent in adjusting the radio and loading the balance of supplies and instruments. After leaving here a supply of fresh water and fruits was secured at Sydney, Nova Scotia, and the ship was headed for the Straits of Belle Isle, where a severe gale and fog were encountered. At midnight, the Battle Harbor light was cleared, the last light that would be seen for over a year, and the ship headed north-northeast for the coast of Greenland under full sail, dodging icebergs and floe ice. After arrival off Greenland 60 hours later, the wind died away, and the motors were used while heading north for Idglorsuit, Greenland, where dogs and fresh water were secured. After departure from Idglorsuit, on August 15, 1937, as many as 2,000 icebergs could be seen at one time; and from here on the ship encountered much ice in Baffin Bay.

At the lower end of Robertson Channel, in latitude 80°15′ N., we were stopped by a wall of ice 15 feet thick. Unable to proceed farther, we tried to seek shelter in Ellesmere Island only to find the whole coast blocked with ice. We therefore drifted south along the Greenland coast; it was necessary to get into winter quarters as soon as possible, because new ice was already forming, and there was danger of becoming frozen in. We arrived in Foulke Fiord, August 31, 1937. The charts showed 40 feet of water, and the ship drew only 12 feet, but much to our surprise we soon saw rock a few feet below the water, and the next thing we knew we were on the rock. The tide went out and left the ship high and dry, but by unloading part of our supplies we were able to refloat at the next high tide. However, a severe storm blew the ship out to sea, the anchors being unable to hold on the rocky bottom. After two days we were able to get back to Reindeer Point, Greenland, near Etah. One of the motors was damaged in the storm, putting such a load on the other motor that it exploded and set fire to the ship. Once back in the harbor, we found that most of the supplies were under water, as a 10-foot tide ebbed and flowed there.

The ship was unloaded, and work started on the building. Observations were begun September 8, 1937. The instrumental equipment included barometers, barograph, thermometers, thermograph, triple register, shelter-sling psychrometer, rain-gage, sunshine recorder, theodolite and balloon equipment, and also an aerometeorograph which, however, we were unable to use. All observations were made on 75th meridian time, to conform with observations made in the United States. Observations were made hourly; and coded reports transmitted daily to the United States by our own radio, and then sent by land line to the United States Weather Bureau at Washington. Pilot-balloon observations were made twice daily except during December and January. All observations were continued until the hour of sailing, July 7, 1938.

On the trip homeward, the Baffin Bay ice jam held the ship for 6 weeks; and it was not long before we discovered that the severe winter had crippled the vessel more than we had expected. Several seams had opened up, and constant pumping was required during the last 10 days before we reached St. John's, Newfoundland, where repairs were made. On the voyage to New York, we encountered the tropical hurricane that moved up the Atlantic coast in September, 1938, and lost the forecastle. We came into New York after being out 15 months and 4 days.

It is hoped that similar observations may be conducted in the near future at some point farther to the west, perhaps in northern Alaska or in Banks Land or Victoria Land, to obtain further data to aid in the study of the polar air masses that often pour down over the United States.

## SUMMARY OF SURFACE METEOROLOGICAL DATA

*Monthly meteorological summary, Etah, Greenland Station*

[Latitude 78°20′ North, longitude 72°42′ West]

SEPTEMBER 1937

| Date | Temperature, °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day [a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.[a] | Local noon | P. M.[a] | Total | Snowfall, p. m. to p. m.[a] (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 9 | 32 | 20 | 26 | 81 | 70 | 68 | 0.00 | 0.0 | | |
| 10 | 26 | 20 | 23 | 88 | 82 | 93 | .00 | .0 | N | |
| 11 | 32 | 22 | 27 | 94 | 72 | 61 | .00 | .0 | N | Clear. |
| 12 | 32 | 21 | 26 | 82 | 76 | 81 | .00 | .0 | NE | Cloudy. |
| 13 | 33 | 20 | 26 | 75 | 78 | 76 | T | T | E | Cloudy. |
| 14 | 33 | 30 | 32 | 88 | 73 | 73 | .00 | .0 | NESE. | Cloudy. |
| 15 | 30 | 25 | 28 | 76 | 88 | 74 | .00 | .0 | E | Cloudy. |
| 16 | 25 | 19 | 22 | 78 | 67 | 64 | .00 | .0 | E | Clear. |
| 17 | 27 | 19 | 23 | 72 | 75 | 72 | T | T | E | Clear. |
| 18 | 32 | 17 | 24 | 72 | 77 | 70 | .00 | .0 | NE | Clear. |
| 19 | 31 | 24 | 28 | 77 | 80 | 88 | T | T | SW | Cloudy. |
| 20 | 28 | 22 | 25 | 97 | 93 | 92 | .01 | .0 | SW | Cloudy. |
| 21 | 29 | 22 | 26 | 78 | 83 | 85 | .01 | .1 | W | Cloudy. |
| 22 | 34 | 21 | 28 | 67 | 58 | 49 | .00 | .0 | N | Pt. cloudy. |
| 23 | 34 | 25 | 30 | 43 | 46 | 58 | .00 | .0 | SW | Clear. |
| 24 | 34 | 27 | 30 | 56 | 60 | 58 | .03 | .3 | SE | Cloudy. |
| 25 | 29 | 26 | 28 | 75 | 94 | 89 | .21 | 2.1 | SE | Cloudy. |
| 26 | 27 | 25 | 26 | 68 | 70 | 69 | T | T | SE | Cloudy. |
| 27 | 29 | 19 | 24 | 84 | 70 | 73 | .03 | .3 | SE | Cloudy. |
| 28 | 19 | 12 | 16 | 78 | 76 | 73 | .01 | .1 | N | Cloudy. |
| 29 | 18 | 10 | 14 | 69 | 63 | 86 | .00 | .0 | NW | Cloudy. |
| 30 | 32 | 15 | 24 | 48 | 54 | 73 | .00 | .0 | NW | Pt. cloudy. |
| Mean | 29.4 | 21.0 | 25.2 | 75 | 73 | 74 | [b] .30 | [b] 2.9 | E | |

[a] 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

### SUMMARY

*Barometric pressure.*—Monthly mean, 29.91; highest, 30.34, Sept. 10; lowest, 29.57, Sept. 12.

*Temperature.*—Highest, 35, Sept. 24; lowest, 10, Sept. 29.

*Precipitation.*—Greatest amount in 24 hours, 0.21, Sept. 25. Snowfall, greatest 24-hour amount, 2.1, Sept. 25; snow on ground on 15th, 0.0; and at end of month, 2.3.

*Wind.*—Prevailing direction, E.; average hourly velocity, 9.6.

*Weather.*—Number of days clear, 5; partly cloudy, 2; cloudy 13; with measurable precipitation (0.01 inch, or more), 6.

*Miscellaneous phenomena—Dates of.*—Sleet, Sept. 20, 21.

*Monthly meteorological summary, Etah, Greenland Station*—Con.

OCTOBER 1937

| Date | Temperature °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day [a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.[a] | Local noon | P. M.[a] | Total | Snowfall p. m. to p. m.[a] (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | 26 | 15 | 20 | 60 | 54 | 35 | 0.00 | 0.0 | NW | Pt. cloudy. |
| 2 | 27 | 20 | 24 | 55 | 69 | 70 | .00 | .0 | NE | Pt. cloudy. |
| 3 | 30 | 20 | 25 | 69 | 70 | 63 | .00 | .0 | NW | Pt. cloudy. |
| 4 | 24 | 15 | 20 | 80 | 78 | 70 | T | T | NE | Cloudy. |
| 5 | 15 | 9 | 12 | 73 | 56 | 53 | T | T | NE | Cloudy. |
| 6 | 22 | 7 | 14 | 57 | 74 | 75 | T | T | NW | Pt. cloudy. |
| 7 | 26 | 22 | 24 | 62 | 94 | 65 | .00 | .0 | NE | Cloudy. |
| 8 | 24 | 15 | 20 | 60 | 87 | 84 | .02 | .2 | NW | Cloudy. |
| 9 | 18 | 7 | 12 | 65 | 71 | 54 | T | T | N | Pt. cloudy. |
| 10 | 18 | 8 | 13 | 84 | 90 | 85 | .10 | 1.0 | NW | Cloudy. |
| 11 | 20 | 10 | 15 | 76 | 89 | 45 | T | T | NW | Pt. cloudy. |
| 12 | 23 | 10 | 16 | 66 | 90 | 79 | .01 | .1 | SE | Cloudy. |
| 13 | 10 | 2 | 6 | 95 | 89 | 95 | .07 | .7 | N | Cloudy. |
| 14 | 4 | −1 | 2 | 82 | 90 | 86 | .01 | .1 | N | Pt. cloudy. |
| 15 | 1 | −6 | −2 | 47 | 81 | 88 | T | T | NW | Clear. |
| 16 | −4 | −12 | −8 | 69 | 90 | 71 | T | T | NW | Pt. cloudy. |
| 17 | 1 | −11 | −5 | 79 | 77 | 83 | .00 | .0 | NW | Clear. |
| 18 | 2 | −3 | 0 | 65 | 53 | 75 | .00 | .0 | NW | Pt. cloudy. |
| 19 | 4 | −3 | 0 | 72 | 38 | 60 | .00 | .0 | NW | Pt. cloudy. |
| 20 | 7 | −1 | 3 | 58 | 60 | 78 | .00 | .0 | W | Clear. |
| 21 | 17 | 6 | 12 | 90 | 80 | 76 | T | T | SE | Pt. cloudy. |
| 22 | 22 | 15 | 18 | 80 | 64 | 86 | T | T | SE | Cloudy. |
| 23 | 22 | 17 | 20 | 87 | 93 | 84 | .03 | .3 | S | Cloudy. |
| 24 | 24 | 16 | 20 | 92 | 37 | 94 | .03 | .3 | SE | Cloudy. |
| 25 | 26 | 20 | 23 | 60 | 63 | 80 | .00 | .0 | NE | Cloudy. |
| 26 | 21 | 11 | 16 | 64 | 62 | 69 | .00 | .0 | N | Pt. cloudy. |
| 27 | 16 | 11 | 14 | 73 | 38 | 77 | .00 | .0 | NW | Clear. |
| 28 | 16 | 11 | 14 | 70 | 77 | 92 | T | T | NW | Cloudy. |
| 29 | 11 | 0 | 6 | 68 | 90 | 78 | T | T | NW | Pt. cloudy. |
| 30 | 3 | −2 | 0 | 77 | 62 | 62 | .00 | .0 | N | Clear. |
| 31 | 3 | −1 | 1 | 36 | 52 | 76 | .00 | .0 | N | Clear. |
| Mean. | 15.5 | 7.3 | 11.4 | 70 | 72 | 74 | [b].27 | [b]2.7 | NW | |

[a] 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

*Barometric pressure.*—Monthly mean, 30.01; highest, 30.39, Oct. 24; lowest, 29.56, Oct. 20.
*Temperature.*—Highest, 30, Oct. 3; lowest, −12, Oct. 16.
*Precipitation.*—Greatest amount in 24 hours, 0.10, Oct. 10. Snowfall, greatest 24-hour amount, 1.0, Oct. 10; snow on ground on 15th, 2.6; and at end of month, 2.3.
*Wind.*—Prevailing direction, NW.; average hourly velocity, 11.3.
*Weather.*—Number of days clear, 6; partly cloudy, 13; cloudy, 12; with measurable precipitation (0.01 inch, or more), 7.

*Monthly meteorological summary, Etah, Greenland Station*—Con.

NOVEMBER 1937

| Date | Temperature °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day [a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.[a] | Local noon | P. M.[a] | Total | Snowfall p. m. to p. m.[a] (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | 6 | −1 | 2 | 59 | 63 | 95 | 0.00 | 0.0 | N | Clear. |
| 2 | 6 | 3 | 4 | 59 | 74 | 89 | .00 | .0 | NW | Cloudy. |
| 3 | 6 | 0 | 3 | 88 | 55 | 89 | .00 | .0 | NW | Cloudy |
| 4 | 10 | −2 | 4 | 76 | 76 | 70 | T | T | NW | Cloudy. |
| 5 | 4 | −2 | 1 | 83 | 87 | 87 | T | T | N | Pt. cloudy. |
| 6 | 6 | 0 | 3 | 70 | 73 | 73 | T | T | NW | Cloudy. |
| 7 | 10 | 4 | 7 | 84 | 86 | 80 | .01 | .1 | NW | Cloudy. |
| 8 | 12 | 5 | 8 | 76 | 90 | 81 | .03 | .3 | N | Pt. cloudy. |
| 9 | 11 | 3 | 7 | 73 | 67 | 63 | T | T | NW | Cloudy. |
| 10 | 14 | 7 | 10 | 91 | 83 | 91 | .02 | .2 | NW | Cloudy. |
| 11 | 11 | 2 | 6 | 91 | 66 | 86 | .04 | .4 | W | Cloudy. |
| 12 | 5 | 0 | 2 | 93 | 68 | 82 | .00 | .0 | N | Clear. |
| 13 | 3 | −3 | 0 | 76 | 53 | 76 | T | T | NW | Clear. |
| 14 | 10 | 0 | 5 | 68 | 64 | 70 | .01 | .1 | NW | Pt. cloudy. |
| 15 | 12 | −1 | 6 | 70 | 88 | 95 | .00 | .0 | NW | Clear. |
| 16 | 17 | 12 | 14 | 96 | 67 | 86 | T | T | E | Cloudy. |
| 17 | 16 | 7 | 12 | 86 | 87 | 91 | .06 | .6 | NW | Cloudy. |
| 18 | 8 | 0 | 4 | 95 | 82 | 76 | .03 | .3 | NW | Cloudy. |
| 19 | 12 | 1 | 6 | 84 | 84 | 72 | .02 | .2 | NW | Cloudy. |
| 20 | 13 | 4 | 8 | 83 | 84 | 89 | .02 | .2 | NW | Cloudy. |
| 21 | 11 | 5 | 8 | 95 | 95 | 96 | .10 | 1.0 | NW | Cloudy. |
| 22 | 16 | 7 | 12 | 82 | 80 | 82 | .06 | .6 | SW | Cloudy. |
| 23 | 10 | 2 | 6 | 78 | 70 | 91 | .02 | .2 | NW | Cloudy. |
| 24 | 6 | −3 | 2 | 77 | 84 | 88 | T | T | NW | Pt. cloudy. |
| 25 | 6 | −5 | 0 | 72 | 71 | 73 | T | T | NW | Pt. cloudy. |
| 26 | −3 | −11 | −7 | 70 | 44 | 70 | .01 | .1 | NW | Pt. cloudy. |
| 27 | −2 | −8 | −5 | 68 | 49 | 83 | .00 | .0 | NW | Pt. cloudy. |
| 28 | 10 | −7 | 2 | 66 | 61 | 90 | T | T | NW | Cloudy |
| 29 | 10 | −1 | 4 | 79 | 75 | 78 | .10 | 1.0 | NW | Cloudy. |
| 30 | 3 | −5 | −1 | 88 | 46 | 80 | .00 | .0 | WNW. | Clear. |
| Mean. | 8.6 | .4 | 4.5 | 79 | 73 | 82 | [b].53 | [b]5.3 | NW | |

[a] 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

*Barometric pressure.*—Monthly mean, 29.94; highest, 30.62, Nov. 11; lowest, 29.48, Nov. 22.
*Temperature.*—Highest, 17, Nov. 16; lowest, −11, Nov. 26.
*Precipitation.*—Greatest amount in 24 hours, 0.10, Nov. 21. Snowfall, greatest 24-hour amount, 1.0, Nov. 21; snow on ground on 15th, 2.0; and at end of month, 5.0.
*Wind.*—Prevailing direction, NW.; average hourly velocity, 10.8.
*Weather.*—Number of days clear, 5; partly cloudy, 7; cloudy, 18; with measurable precipitation (0.01 inch, or more), 14.

*Monthly meteorological summary, Etah, Greenland Station*—Con.

DECEMBER 1937

| Date | Temperature °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day* ◦ |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.* | Local noon | P. M.* | Total | Snowfall p. m. to p. m.* (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | 2 | −10 | −4 | 49 | 69 | 44 | 0.00 | 0.0 | N | Pt. cloudy. |
| 2 | 3 | −5 | −1 | 68 | 68 | 70 | .04 | .4 | NW | Pt. cloudy. |
| 3 | 8 | −1 | 4 | 70 | 86 | 88 | .00 | .0 | NW | Clear. |
| 4 | 2 | −6 | −2 | 67 | 59 | 60 | T | T | N | Clear. |
| 5 | 10 | −6 | 2 | 72 | 77 | 75 | .04 | .4 | NW | Pt. cloudy. |
| 6 | 7 | 0 | 4 | 56 | 85 | 93 | T | T | NW | Clear. |
| 7 | 6 | −2 | 2 | 88 | 68 | 79 | .02 | .2 | E | Pt. cloudy. |
| 8 | −1 | −11 | −6 | 64 | 28 | 51 | T | T | NW | Clear. |
| 9 | −6 | −13 | −10 | 29 | 82 | 68 | .00 | .0 | NW | Clear. |
| 10 | −10 | −17 | −14 | 45 | 31 | 31 | .00 | .0 | NW | Clear. |
| 11 | −4 | −15 | −10 | 63 | 82 | 76 | T | T | SE | Pt. cloudy. |
| 12 | −7 | −12 | −10 | 68 | 63 | 78 | .01 | .1 | NW | Pt. cloudy. |
| 13 | 4 | −11 | −4 | 71 | 80 | 85 | .04 | .4 | NW | Cloudy. |
| 14 | −8 | −15 | −12 | 81 | 75 | 76 | .03 | .3 | NW | Pt. cloudy. |
| 15 | −9 | −15 | −12 | 66 | 77 | 68 | T | T | NW | Pt. cloudy. |
| 16 | −4 | −10 | −7 | 63 | 81 | 76 | .02 | .2 | NW | Pt. cloudy. |
| 17 | −1 | −12 | −6 | 61 | 65 | 57 | .01 | .1 | N | Pt. cloudy. |
| 18 | −9 | −14 | −12 | 57 | 44 | 88 | .00 | .0 | N | Cloudy. |
| 19 | −14 | −21 | −18 | 45 | 84 | 82 | .00 | .0 | NW | Clear. |
| 20 | −16 | −22 | −19 | 61 | 61 | 83 | .00 | .0 | NW | Clear. |
| 21 | −14 | −19 | −16 | 56 | 19 | 53 | .00 | .0 | NW | Clear. |
| 22 | −10 | −15 | −12 | 61 | 72 | 88 | .00 | .0 | NW | Clear. |
| 23 | −8 | −14 | −11 | 52 | 68 | 59 | T | T | NW | Pt. cloudy. |
| 24 | −5 | −11 | −8 | 72 | 73 | 79 | T | T | NW | Pt. cloudy. |
| 25 | −7 | −11 | −9 | 55 | 50 | 78 | .00 | .0 | N | Clear. |
| 26 | −7 | −15 | −11 | 61 | 27 | 78 | .00 | .0 | NW | Clear. |
| 27 | 2 | −11 | −4 | 76 | 51 | 73 | .00 | .0 | NW | Pt. cloudy. |
| 28 | 2 | −11 | −4 | 79 | 58 | 55 | .04 | .4 | W | Pt. cloudy. |
| 29 | −4 | −10 | −7 | 56 | 54 | 73 | T | T | N | Pt. cloudy. |
| 30 | −10 | −15 | −12 | 57 | 52 | 77 | .00 | .0 | N | Clear. |
| 31 | −6 | −14 | −10 | 52 | 48 | 72 | T | T | NW | Pt. cloudy. |
| Mean. | −3.7 | −11.7 | −7.7 | 62 | 62 | 71 | ♭.25 | ♭2.5 | NW | |

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
◦ Sunrise to sunset.
♭ Total.

SUMMARY

Barometric pressure.—Monthly mean, 30.07; highest, 30.84, Dec. 8; lowest, 29.48, Dec. 17.
Temperature.—Highest, 10, Dec. 5; lowest, −22, Dec. 20.
Precipitation.—Greatest amount in 24 hours, 0.07, Dec. 13–14. Snowfall, greatest 24-hour amount, 0.7, Dec. 13–14; snow on ground on 15th, 6.3; and at end of month, 6.3.
Wind.—Prevailing direction, NW.; average hourly velocity, 10.0.
Weather.—Number of days clear, 13; partly cloudy, 16; cloudy, 2; with measurable precipitation (0.01 inch, or more), 9.
Miscellaneous phenomena—Dates of.—Halos, lunar, Dec. 14, 16.

*Monthly meteorological summary, Etah, Greenland Station*—Con.

JANUARY 1938

| Date | Temperature °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day ◦ |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.* | Local noon | P. M.* | Total | Snowfall p. m. to p. m.* (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | −9 | −16 | −12 | 57 | 77 | 63 | 0.01 | 0.1 | NNW | Pt. cloudy. |
| 2 | −6 | −12 | −9 | 57 | 51 | 73 | .00 | .0 | NW | Pt. cloudy. |
| 3 | 0 | −12 | −6 | 59 | 58 | 86 | .01 | .1 | NW | Pt. cloudy. |
| 4 | −3 | −11 | −7 | 84 | 83 | 68 | .00 | .0 | NW | Pt. cloudy. |
| 5 | −7 | −13 | −10 | 76 | 78 | 42 | .00 | .0 | NW | Clear. |
| 6 | 1 | −11 | −5 | 78 | 65 | 93 | T | T | S | Cloudy. |
| 7 | −1 | −13 | −7 | 73 | 89 | 66 | T | T | NNW | Clear. |
| 8 | −7 | −14 | −10 | 52 | 74 | 64 | .00 | .0 | NW | Clear. |
| 9 | 3 | −8 | −2 | 42 | 82 | 75 | .02 | .2 | E | Cloudy. |
| 10 | 2 | −8 | −3 | 56 | 92 | 72 | .00 | .0 | NW | Pt. cloudy. |
| 11 | −5 | −18 | −12 | 50 | 76 | 87 | .00 | .0 | NW | Cloudy. |
| 12 | −18 | −25 | −22 | 43 | 78 | 76 | .00 | .0 | NW | Cloudy. |
| 13 | −22 | −26 | −24 | 76 | 76 | 24 | .00 | .0 | NW | Cloudy. |
| 14 | −18 | −24 | −21 | 80 | 84 | 82 | T | T | E | Cloudy. |
| 15 | −20 | −22 | −21 | 82 | 81 | 63 | .00 | .0 | SE | Cloudy. |
| 16 | −19 | −26 | −22 | 59 | 29 | 76 | .00 | .0 | NW | Clear. |
| 17 | −20 | −25 | −22 | 39 | 77 | 53 | .00 | .0 | NW | Clear. |
| 18 | −21 | −26 | −24 | 53 | 77 | 78 | .00 | .0 | NW | Clear. |
| 19 | −17 | −24 | −20 | 59 | 83 | 81 | .00 | .0 | NW | Clear. |
| 20 | −13 | −20 | −16 | 82 | 59 | 56 | .00 | .0 | NW | Clear. |
| 21 | −7 | −12 | −10 | 70 | 63 | 79 | .01 | .1 | SE | Cloudy. |
| 22 | −10 | −12 | −11 | 78 | 89 | 89 | T | T | SE | Cloudy. |
| 23 | −6 | −10 | −8 | 70 | 90 | 81 | .03 | .3 | NW | Cloudy. |
| 24 | −8 | −11 | −10 | 70 | 90 | 59 | .00 | .0 | NW | Cloudy. |
| 25 | −11 | −17 | −14 | 76 | 75 | 71 | .00 | .0 | NW | Clear. |
| 26 | −9 | −20 | −14 | 70 | 63 | 87 | .03 | .3 | E | Cloudy. |
| 27 | −20 | −30 | −25 | 28 | 72 | 72 | .00 | .0 | N | Pt. cloudy. |
| 28 | −22 | −29 | −26 | 74 | 53 | 76 | .00 | .0 | W | Clear. |
| 29 | −17 | −23 | −20 | 43 | 63 | 65 | .00 | .0 | N | Clear. |
| 30 | −7 | −19 | −13 | 60 | 34 | 68 | .00 | .0 | N | Clear. |
| 31 | −10 | −16 | −13 | 74 | 50 | 76 | .00 | .0 | NW | Clear. |
| Mean. | −10.5 | −17.8 | −14.2 | 64 | 71 | 71 | ♭1.1 | ♭1.1 | NW | |

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
◦ Sunrise to sunset.
♭ Total.

SUMMARY

*Barometric pressure.*—Monthly mean, 29.87; highest, 30.48, Jan. 5; lowest, 29.32, Jan. 20.
*Temperature.*—Highest, 3, Jan. 9; lowest, −30, Jan. 27.
*Precipitation.*—Greatest amount in 24 hours, 0.03, Jan. 23, 26. Snowfall, greatest 24-hour amount, 0.3, Jan. 23, 26; snow on ground on 15th, 6.6; and at end of month, 7.3.
*Wind.*—Prevailing direction, NW., average hourly velocity, 8.9.
*Weather.*—Number of days clear, 13; partly cloudy, 6; cloudy, 12; with measurable precipitation (0.01 inch, or more), 6.
*Miscellaneous phenomena—Dates of.*—Halos, lunar, Jan. 8, 13, 15. Fog, light, Jan. 26, 27.

*Monthly meteorological summary, Etah, Greenland Station—Con.*

FEBRUARY 1938

| Date | Temperature °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day [a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.[a] | Local noon | P. M.[a] | Total | Snowfall p. m. to p. m.[a] (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | −10 | −17 | −14 | 63 | 63 | 74 | 0.00 | 0.0 | NW | Clear. |
| 2 | −10 | −19 | −14 | 76 | 63 | 74 | .00 | .0 | NW | Clear. |
| 3 | −9 | −23 | −16 | 24 | 68 | 76 | .00 | .0 | NW | Clear. |
| 4 | −9 | −15 | −12 | 59 | 50 | 77 | .00 | .0 | NW | Clear. |
| 5 | −10 | −18 | −14 | 23 | 63 | 88 | .00 | .0 | NW | Clear. |
| 6 | −3 | −14 | −8 | 78 | 82 | 66 | .00 | .0 | NW | Clear. |
| 7 | −8 | −17 | −12 | 75 | 42 | 57 | .00 | .0 | NW | Clear. |
| 8 | −5 | −12 | −8 | 79 | 56 | 73 | .00 | .0 | NW | Cloudy. |
| 9 | −5 | −11 | −8 | 73 | 79 | 68 | .00 | .0 | NW | Pt. cloudy. |
| 10 | −12 | −18 | −15 | 87 | 85 | 87 | .00 | .0 | NNW | Clear. |
| 11 | −11 | −18 | −14 | 58 | 66 | 52 | .00 | .0 | N | Clear. |
| 12 | −10 | −13 | −12 | 68 | 77 | 52 | .00 | .0 | NW | Clear. |
| 13 | −3 | −16 | −10 | 82 | 68 | 70 | .00 | .0 | NW | Clear. |
| 14 | 0 | −17 | −8 | 53 | 71 | 84 | .03 | .3 | E | Cloudy. |
| 15 | −3 | −8 | −6 | 77 | 75 | 56 | T | T | NW | Cloudy. |
| 16 | −4 | −10 | −7 | 82 | 76 | 82 | T | T | W | Cloudy. |
| 17 | −2 | −12 | −7 | 78 | 66 | 69 | .00 | .0 | W | Pt. cloudy. |
| 18 | 3 | −7 | −2 | 88 | 78 | 75 | .01 | .1 | W | Cloudy. |
| 19 | −6 | −17 | −12 | 81 | 89 | 69 | T | T | E | Pt. cloudy. |
| 20 | −16 | −22 | −19 | 51 | 81 | 82 | .00 | .0 | NW | Clear. |
| 21 | −15 | −20 | −18 | 53 | 84 | 69 | .00 | .0 | N | Clear. |
| 22 | −13 | −21 | −17 | 63 | 83 | 69 | .00 | .0 | N | Clear. |
| 23 | −9 | −19 | −14 | 77 | 58 | 72 | T | T | NW | Pt. cloudy. |
| 24 | −14 | −25 | −20 | 78 | 81 | 81 | .00 | .0 | NW | Clear. |
| 25 | −23 | −26 | −24 | 78 | 77 | 77 | .00 | .0 | N | Clear. |
| 26 | −21 | −26 | −24 | 57 | 53 | 29 | T | T | N | Pt. cloudy. |
| 27 | −11 | −22 | −16 | 63 | 84 | 52 | .02 | .2 | N, NW, SE | Cloudy. |
| 28 | −8 | −14 | −11 | 76 | 36 | 90 | T | T | E | Cloudy. |
| Mean | −8.8 | −17.0 | −12.9 | 68 | 70 | 70 | [b].06 | [b].6 | NW | |

[a] 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.

SUMMARY

*Barometric pressure.*—Monthly mean, 29.92; highest, 30.63, Feb. 19; lowest, 29.22, Feb. 27.
*Temperature.*—Highest, 3, Feb. 18; lowest, −26, Feb. 26.
*Precipitation.*—Greatest amount in 24 hours, 0.03, Feb. 14. Snowfall, greatest 24-hour amount, 0.3, Feb. 14; snow on ground on 15th, 7.4; and at end of month, 7.7.
*Wind.*—Prevailing direction, NW; average hourly velocity, 10.0.
*Weather.*—Number of days clear, 16; partly cloudy, 5; cloudy, 7; with measurable precipitation (0.01 inch, or more), 3.
*Miscellaneous phenomena—Dates of.*—Fog, light, Feb. 10, 14, 15, 19, 23, 26, 27, 28, fog, dense, Feb. 26, 27.

*Monthly meteorological summary, Etah, Greenland Station—Con.*

MARCH 1938

| Date | Temperature °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day [a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.[a] | Local noon | P. M.[a] | Total | Snowfall p. m. to p. m.[a] (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | −8 | −10 | −9 | 70 | 90 | 79 | 0.02 | 0.2 | SE | Cloudy. |
| 2 | −8 | −17 | −12 | 70 | 52 | 86 | .00 | .0 | NW | Pt. cloudy. |
| 3 | −12 | −19 | −16 | 76 | 65 | 70 | T | T | N | Pt. cloudy. |
| 4 | −8 | −18 | −13 | 70 | 86 | 72 | T | T | N | Pt. cloudy. |
| 5 | −9 | −17 | −13 | 85 | 86 | 88 | .00 | .0 | NW | Clear. |
| 6 | −5 | −14 | −10 | 63 | 68 | 79 | .00 | .0 | N | Clear. |
| 7 | 0 | −12 | −6 | 66 | 83 | 78 | .01 | .1 | N | Cloudy. |
| 8 | 3 | −6 | −2 | 76 | 85 | 82 | .02 | .2 | NW | Cloudy. |
| 9 | 5 | −6 | 0 | 71 | 58 | 74 | T | T | NW | Pt. cloudy. |
| 10 | −1 | −8 | −4 | 75 | 78 | 68 | .00 | .0 | NW | Pt. cloudy. |
| 11 | −2 | −8 | −5 | 79 | 69 | 82 | .00 | .0 | NW | Pt. cloudy. |
| 12 | 6 | −10 | −2 | 78 | 51 | 84 | T | T | N | Clear. |
| 13 | 7 | 0 | 4 | 85 | 93 | 84 | .03 | .3 | NW | Cloudy. |
| 14 | 14 | 3 | 8 | 77 | 89 | 92 | .12 | 1.2 | NW | Cloudy. |
| 15 | 7 | 3 | 5 | 92 | 87 | 89 | .02 | .2 | NW | Cloudy. |
| 16 | 3 | −2 | 0 | 81 | 93 | 84 | T | T | N | Cloudy. |
| 17 | 0 | −7 | −4 | 82 | 82 | 84 | .00 | .0 | NW | Cloudy. |
| 18 | −5 | −17 | −11 | 78 | 69 | 76 | .00 | .0 | NW | Cloudy. |
| 19 | −13 | −19 | −16 | 67 | 63 | 64 | .00 | .0 | N | Clear. |
| 20 | −16 | −21 | −18 | 63 | 85 | 83 | .00 | .0 | N | Clear. |
| 21 | −10 | −20 | −15 | 65 | 62 | 62 | .00 | .0 | N | Clear. |
| 22 | −10 | −14 | −12 | 82 | 67 | 61 | .00 | .0 | E | Clear. |
| 23 | −9 | −15 | −12 | 75 | 59 | 64 | .00 | .0 | E | Clear. |
| 24 | −6 | −15 | −10 | 74 | 91 | 60 | .00 | .0 | NE | Pt. cloudy. |
| 25 | −8 | −19 | −14 | 72 | 46 | 49 | .00 | .0 | NE | Clear. |
| 26 | −3 | −14 | −8 | 76 | 60 | 82 | .00 | .0 | E | Clear. |
| 27 | −4 | −17 | −10 | 89 | 74 | 57 | .00 | .0 | NE | Clear. |
| 28 | −1 | −20 | −10 | 85 | 63 | 82 | .00 | .0 | DI[c] | Clear. |
| 29 | 2 | −6 | −2 | 90 | 62 | 67 | .00 | .0 | W | Cloudy. |
| 30 | 4 | −12 | −4 | 89 | 82 | 54 | .00 | .0 | NE | Clear. |
| 31 | −5 | −11 | −8 | 61 | 66 | 46 | .00 | .0 | E | Clear. |
| Mean | −3.0 | −11.9 | −7.4 | 76 | 73 | 74 | [b].22 | [b]2.2 | NW | |

[a] 7 a. m. and p. m., 75th meridian time.
T Indicates a trace of precipitation.
[a] Sunrise to sunset.
[b] Total.
[c] Direction indeterminate.

SUMMARY

*Barometric pressure.*—Monthly mean, 29.91; highest, 30.48, Mar. 31; lowest, 28.92, Mar. 12.
*Temperature.*—Highest, 14, Mar. 14; lowest, −21, Mar. 20.
*Precipitation.*—Greatest amount in 24 hours, 0.14, Mar. 14, 15. Snowfall, greatest 24-hour amount, 1.4, Mar. 14, 15; snow on ground on 15th, 7.5, and at end of month, 6.5.
*Wind.*—Prevailing direction NW.; average hourly velocity, 10.6.
*Weather.*—Number of days clear, 14; partly cloudy, 7; cloudy, 10.
*Miscellaneous phenomena—Dates of.*—Fog, light, Mar. 1, 2, 16, 17, 18, 24, 30, 31.

*Monthly meteorological summary, Etah, Greenland Station—Con.*

APRIL 1938

| Date | Temperature °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day ° |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.* | Local noon | P. M.* | Total | Snowfall p. m. to p. m.* (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | 2 | −8 | −3 | 61 | 75 | 17 | 0.00 | 0.0 | E | Clear. |
| 2 | 5 | −5 | 0 | 61 | 62 | 66 | .00 | .0 | NE | Clear. |
| 3 | 13 | −1 | 6 | 71 | 71 | 88 | .00 | .0 | E | Pt. cloudy. |
| 4 | 10 | −15 | −2 | 39 | 63 | 49 | .00 | .0 | E | Cloudy. |
| 5 | −11 | −21 | −16 | 70 | 50 | 23 | .00 | .0 | E | Pt. cloudy. |
| 6 | −13 | −20 | −16 | 55 | 59 | 69 | .00 | .0 | E | Clear. |
| 7 | −9 | −21 | −15 | 62 | 36 | 48 | .00 | .0 | E | Clear. |
| 8 | 0 | −16 | −8 | 78 | 56 | 72 | .04 | .4 | SW, NE | Cloudy. |
| 9 | −3 | −10 | −6 | 69 | 69 | 12 | .01 | .1 | E | Clear. |
| 10 | −3 | −11 | −7 | 85 | 56 | 33 | .00 | .0 | E | Clear. |
| 11 | 2 | −14 | −6 | 51 | 68 | 23 | .00 | .0 | ENE | Clear. |
| 12 | −1 | −7 | −4 | 65 | 65 | 69 | .05 | .5 | E | Cloudy. |
| 13 | 12 | −5 | 4 | 73 | 62 | 55 | T | T | NE | Cloudy. |
| 14 | 13 | −4 | 4 | 88 | 73 | 72 | .00 | .0 | E | Pt. cloudy. |
| 15 | 8 | −5 | 2 | 67 | 70 | 50 | .00 | .0 | NE | Clear. |
| 16 | 6 | −2 | 2 | 62 | 42 | 48 | .00 | .0 | E | Clear. |
| 17 | 3 | −6 | −2 | 58 | 65 | 52 | .00 | .0 | E | Clear. |
| 18 | 9 | −7 | 1 | 50 | 81 | 79 | .02 | .2 | NE | Cloudy. |
| 19 | 12 | −4 | 4 | 91 | 78 | 75 | .09 | .9 | W | Cloudy. |
| 20 | 1 | −7 | −3 | 87 | 72 | 64 | .00 | .0 | E | Clear. |
| 21 | 14 | −6 | 4 | 77 | 80 | 84 | .03 | .3 | SW | Cloudy. |
| 22 | 17 | 10 | 14 | 89 | 73 | 88 | .05 | .5 | NE | Cloudy. |
| 23 | 20 | 4 | 12 | 78 | 53 | 45 | T | T | NE | Pt. cloudy. |
| 24 | 10 | 0 | 5 | 73 | 72 | 71 | .00 | .0 | E | Pt. cloudy. |
| 25 | 13 | 3 | 8 | 73 | 65 | 69 | T | T | SW | Cloudy. |
| 26 | 12 | 0 | 6 | 56 | 70 | 49 | .00 | .0 | E | Clear. |
| 27 | 12 | 3 | 8 | 62 | 82 | 63 | T | T | NE | Clear. |
| 28 | 13 | 2 | 8 | 71 | 63 | 54 | .00 | .0 | NE | Clear. |
| 29 | 14 | 5 | 10 | 57 | 70 | 72 | .01 | .1 | E | Clear. |
| 30 | 24 | 8 | 16 | 73 | 92 | 55 | .01 | .1 | E, S | Pt. cloudy. |
| Mean | 6.8 | −5.3 | .8 | 68 | 66 | 57 | ♭.31 | ♭3.1 | E | |

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
° Sunrise to sunset.
♭ Total.

SUMMARY

*Barometric pressure.*—Monthly mean, 29.96; highest, 30.43, Apr. 23; lowest, 29.24, Apr. 12.
*Temperature.*—Highest, 24, Apr. 30; lowest, −21, Apr. 7.
*Precipitation.*—Greatest amount in 24 hours, 0.11, Apr. 18, 19. Snowfall, greatest 24-hour amount, 1.1 Apr. 18, 19; snow on ground on 15th, 6.0, and at end of month, 6.6.
*Wind.*—Prevailing direction, E.; average hourly velocity, 10.3.
*Weather.*—Number of days clear, 15; partly cloudy, 6; cloudy, 9; with measurable precipitation (0.01 inch, or more), 9.
*Miscellaneous phenomena—Dates of.*—Fog, light, 8, 9, 19, 20.

*Monthly meteorological summary, Etah, Greenland Station—Con.*

MAY 1938

| Date | Temperature, °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day ° |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.* | Local noon | P. M.* | Total | Snowfall p. m. to p. m.* (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | 14 | 5 | 10 | 65 | 73 | 55 | T | T | SE | Pt. Cloudy. |
| 2 | 18 | 8 | 13 | 76 | 81 | 79 | 0.02 | 0.2 | SW | Cloudy. |
| 3 | 15 | 9 | 12 | 82 | 62 | 60 | T | T | S | Cloudy. |
| 4 | 14 | 10 | 12 | 86 | 84 | 79 | .04 | .4 | SW | Cloudy. |
| 5 | 12 | 9 | 10 | 73 | 90 | 65 | .01 | .1 | SW | Cloudy. |
| 6 | 18 | 8 | 13 | 85 | 57 | 67 | .00 | .0 | SE | Cloudy. |
| 7 | 26 | 11 | 18 | 85 | 78 | 80 | T | T | DI ° | Cloudy. |
| 8 | 25 | 9 | 17 | 92 | 69 | 62 | T | T | E | Clear. |
| 9 | 13 | 3 | 8 | 82 | 66 | 74 | .00 | .0 | E | Pt. cloudy. |
| 10 | 7 | 1 | 4 | 55 | 74 | 68 | .00 | .0 | E | Clear. |
| 11 | 10 | 3 | 6 | 72 | 68 | 65 | .00 | .0 | E | Clear. |
| 12 | 25 | 6 | 16 | 83 | 71 | 81 | .00 | .0 | DI ° | Pt. cloudy. |
| 13 | 27 | 14 | 20 | 84 | 86 | 74 | .00 | .0 | W | Clear. |
| 14 | 31 | 14 | 22 | 89 | 74 | 75 | .00 | .0 | W | Pt. cloudy. |
| 15 | 28 | 20 | 24 | 78 | 75 | 81 | .00 | .0 | W | Pt. cloudy. |
| 16 | 34 | 20 | 27 | 78 | 78 | 78 | .00 | .0 | NE | Clear. |
| 17 | 34 | 24 | 29 | 78 | 69 | 66 | .00 | .0 | W | Cloudy. |
| 18 | 34 | 23 | 28 | 72 | 58 | 88 | .00 | .0 | E | Pt. cloudy. |
| 19 | 29 | 21 | 25 | 68 | 64 | 54 | .00 | .0 | E | Clear. |
| 20 | 30 | 20 | 25 | 68 | 36 | 51 | .00 | .0 | E | Clear. |
| 21 | 33 | 22 | 28 | 63 | 56 | 41 | .00 | .0 | E | Pt. cloudy. |
| 22 | 38 | 25 | 32 | 63 | 54 | 54 | .00 | .0 | E | Pt. cloudy. |
| 23 | 36 | 26 | 31 | 51 | 44 | 45 | .00 | .0 | E | Clear. |
| 24 | 35 | 28 | 32 | 49 | 45 | 49 | .00 | .0 | E | Clear. |
| 25 | 40 | 30 | 35 | 47 | 59 | 50 | .00 | .0 | NE | Clear. |
| 26 | 43 | 31 | 37 | 56 | 44 | 50 | .00 | .0 | E | Clear. |
| 27 | 42 | 33 | 38 | 46 | 46 | 51 | .00 | .0 | E | Clear. |
| 28 | 39 | 30 | 34 | 44 | 73 | 72 | .00 | .0 | SW | Clear. |
| 29 | 36 | 27 | 32 | 80 | 81 | 80 | .00 | .0 | SW | Pt. cloudy. |
| 30 | 40 | 32 | 36 | 53 | 39 | 54 | .00 | .0 | E | Clear. |
| 31 | 31 | 25 | 28 | 60 | 95 | 74 | .00 | .0 | E | Pt. cloudy. |
| Mean | 27.6 | 17.6 | 22.6 | 70 | 66 | 65 | ♭.07 | ♭.7 | E | |

* 7 a. m. and p. m., 75th meridian time.
T indicates a trace of precipitation.
° Sunrise to sunset.
♭ Total.
◦ Direction indeterminate.

SUMMARY

*Barometric pressure.*—Monthly mean, 30.20; highest, 30.87, May 6; lowest, 29.57, May 31.
*Temperature.*—Highest, 43, May 26; lowest, 1, May 10.
*Precipitation.*—Greatest amount in 24 hours, 0.04, May 4. Snowfall, greatest 24-hour amount, 0.4, May 4; snow on ground on 15th, 5.7; and at end of month 0.8.
*Wind.*—Prevailing direction E, average hourly velocity, 8.1.
*Weather.*—Number of days clear, 14; partly cloudy, 10; cloudy, 7; with measurable precipitation (0.01 inch, or more), 3.
*Miscellaneous phenomena—Dates of.*—Halos, solar, 1, 7, 23, 30; fog, light, 2, 4, 5.

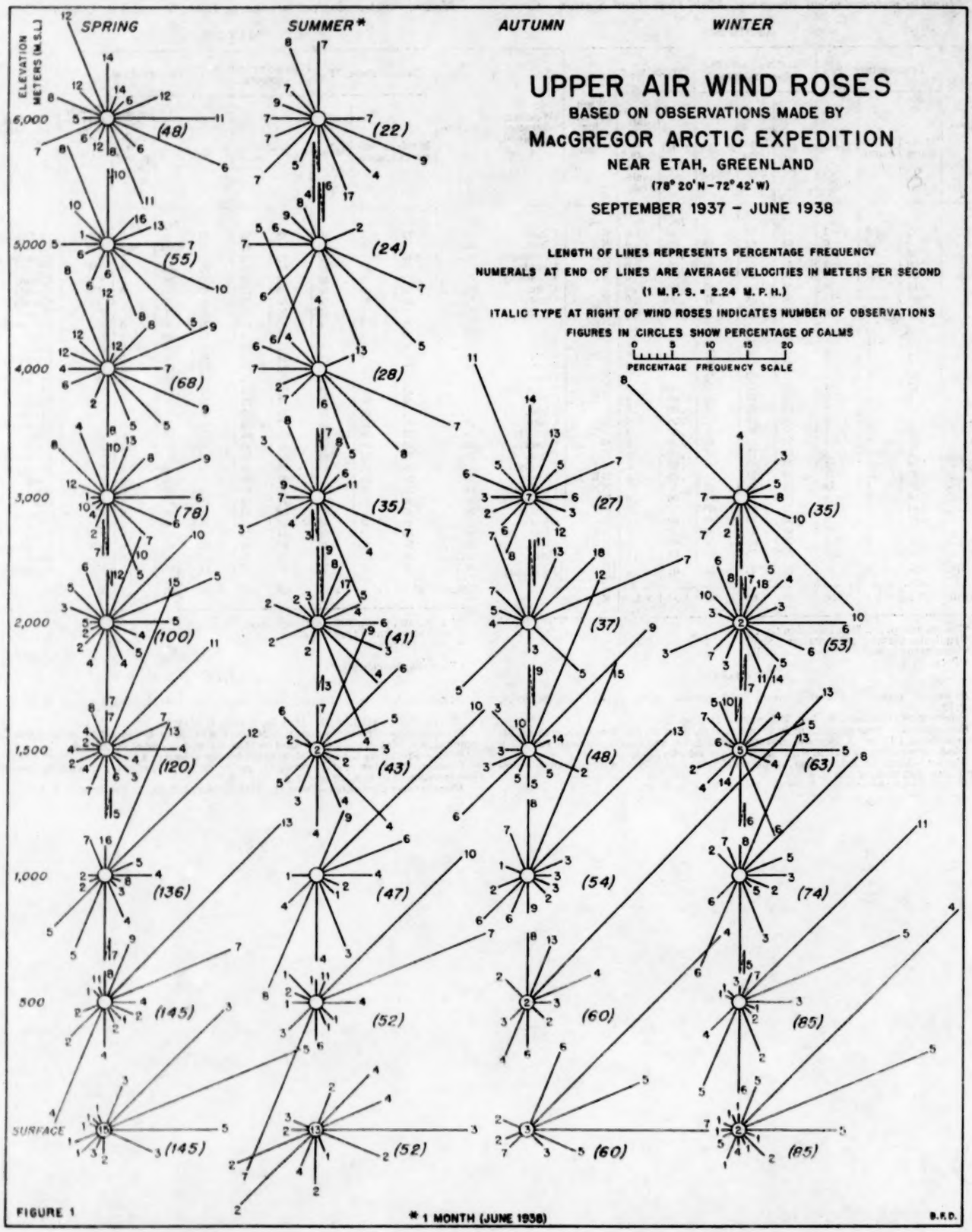


FIGURE 1

* 1 MONTH (JUNE 1938)

B.R.D.

*Monthly meteorological summary, Etah, Greenland Station—Con.*

JUNE 1938

| Date | Temperature, °F. | | | Relative humidity (percentage) | | | Precipitation | | Wind, prevailing direction | Weather, character of day * |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Minimum | Mean | A. M.* | Local noon | P. M.* | Total | Snowfall p. m. to p. m.* (unmelted) | | |
| | | | | | | | *In.* | *In.* | | |
| 1 | 34 | 25 | 30 | 59 | 49 | 49 | T | T | E | Pt. cloudy. |
| 2 | 36 | 26 | 31 | 53 | 48 | 60 | 0.00 | 0.0 | E | Clear. |
| 3 | 37 | 28 | 32 | 54 | 95 | 82 | T | T | W | Pt. cloudy. |
| 4 | 33 | 29 | 31 | 83 | 96 | 98 | T | T | W | Cloudy. |
| 5 | 32 | 29 | 30 | 92 | 95 | 91 | .01 | .1 | SW | Cloudy. |
| 6 | 34 | 28 | 31 | 77 | 90 | 74 | .00 | .0 | W | Pt. cloudy. |
| 7 | 37 | 30 | 34 | 52 | 62 | 70 | .00 | .0 | SW | Pt. cloudy. |
| 8 | 36 | 30 | 33 | 63 | 66 | 78 | .00 | .0 | SW | Cloudy. |
| 9 | 40 | 30 | 35 | 72 | 63 | 52 | .00 | .0 | W | Pt. cloudy. |
| 10 | 46 | 34 | 40 | 57 | 77 | 55 | .00 | .0 | E | Clear. |
| 11 | 46 | 35 | 40 | 58 | 51 | 48 | .00 | .0 | NE | Pt. cloudy. |
| 12 | 46 | 33 | 40 | 77 | 68 | 69 | .00 | .0 | W | Cloudy. |
| 13 | 47 | 36 | 42 | 68 | 63 | 72 | .00 | .0 | W | Pt. cloudy. |
| 14 | 49 | 37 | 43 | 49 | 52 | 50 | .00 | .0 | E | Pt. cloudy. |
| 15 | 40 | 33 | 36 | 75 | 65 | 81 | T | T | W | Cloudy. |
| 16 | 48 | 32 | 40 | 73 | 53 | 57 | .00 | .0 | E | Clear. |
| 17 | 40 | 32 | 36 | 74 | 82 | 74 | .00 | .0 | W | Clear. |
| 18 | 37 | 29 | 33 | 95 | 72 | 90 | .00 | .0 | SW | Cloudy. |
| 19 | 35 | 27 | 31 | 92 | 92 | 96 | .00 | .0 | SW | Cloudy. |
| 20 | 37 | 29 | 33 | 92 | 83 | 92 | .00 | .0 | SW | Cloudy. |
| 21 | 42 | 32 | 37 | 82 | 88 | 79 | .00 | .0 | SW | Cloudy. |
| 22 | 47 | 36 | 42 | 79 | 88 | 85 | .00 | .0 | W | Cloudy. |
| 23 | 57 | 40 | 48 | 56 | 69 | 60 | .00 | .0 | E | Clear. |
| 24 | 52 | 39 | 46 | 49 | 59 | 54 | .00 | .0 | E | Pt. cloudy. |
| 25 | 55 | 42 | 48 | 67 | 56 | 56 | T | .0 | E | Pt. cloudy. |
| 26 | 50 | 39 | 44 | 56 | 50 | 50 | .00 | .0 | SE | Clear. |
| 27 | 56 | 43 | 50 | 54 | 48 | 46 | .00 | .0 | E | Clear. |
| 28 | 60 | 45 | 52 | 43 | 34 | 33 | .00 | .0 | E | Clear. |
| 29 | 59 | 40 | 50 | 55 | 53 | 57 | .00 | .0 | SW | Pt. cloudy. |
| 30 | 53 | 39 | 46 | 46 | 49 | 55 | .00 | .0 | W | Clear. |
| Mean | 44.0 | 33.6 | 38.8 | 67 | 67 | 67 | b.01 | b.1 | E | |

* 7 a. m. and p. m. 75th meridian time.
T indicates a trace of precipitation.
* Sunrise to sunset.
b Total.

SUMMARY

*Barometric pressure.*—Monthly mean, 30.02; highest, 30.40, June 6; lowest, 29.49, June 14.

*Temperature.*—Highest, 60, June 28; lowest, 25, June 1.

*Precipitation.*—Greatest amount in 24 hours, 0.01, June 5. Snowfall, greatest 24-hour amount, 0.1, June 5; snow on ground on 15th 0.2, and at end of month T.

*Wind.*—Prevailing direction, E; average hourly velocity, 7.0.

*Weather.*—Number of days clear, 9; partly cloudy, 11; cloudy, 10.

*Miscellaneous phenomena—Dates of.*—Halos, solar, June 7, 14, 29; fog, light, June 3, 4, 5, 15, 18, 19, 20; fog, dense, 18, 19, 20.

## PILOT-BALLOON OBSERVATIONS

The expedition secured a total of 341 pilot-balloon observations during the period September 10, 1937, to June 30, 1938, inclusive. When weather permitted, these observations were made daily at 12 noon (75th meridian time) during the months of November, December, and January and at 6 a. m. and 6 p. m. during all other months. The wind data obtained by these observations are shown in detail for standard levels in tables 1 and 1A. Wind roses, prepared from these data for all levels having a total of 20 observations or more, are also shown by seasons (summer being represented by June 1938 only) in figures 1 and 2. Resultant winds for the same levels are shown in figure 3.

The heights of cloud bases were obtained by means of the pilot-balloon observations on 91 occasions. The average cloud heights, based on these data, are shown in table 2.

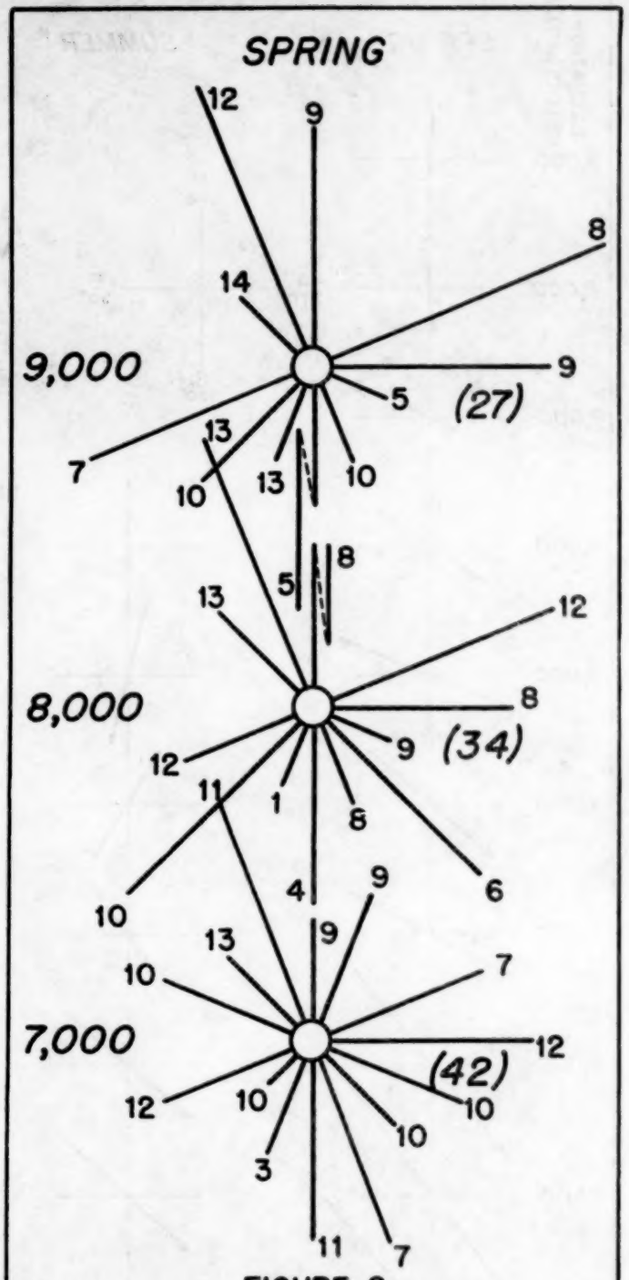


FIGURE 2
CONTINUATION OF WIND ROSES SHOWN IN FIGURE 1

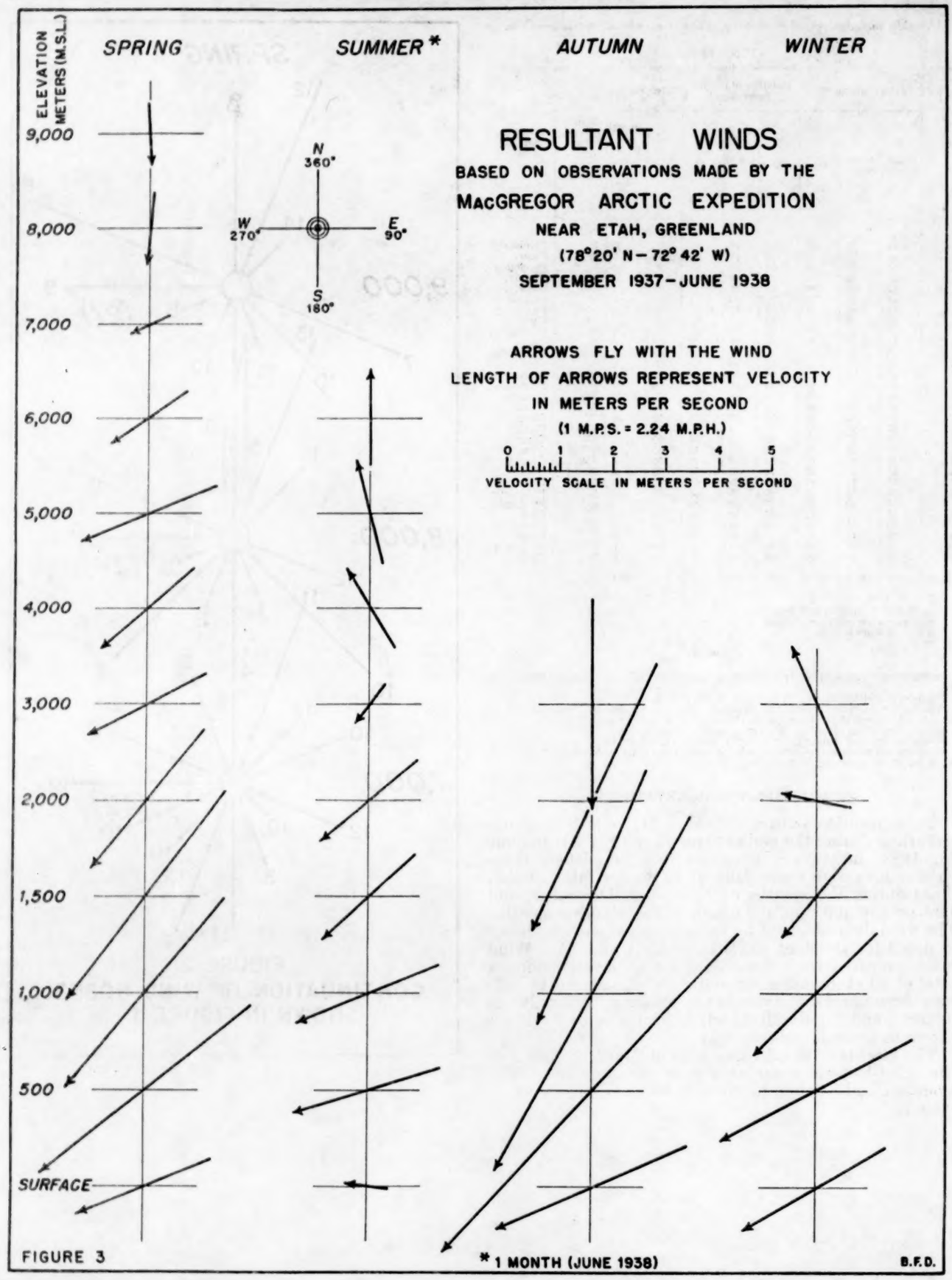
ELEVATION METERS (M.S.L.)
SPRING
SUMMER *
AUTUMN
WINTER
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,500
1,000
500
SURFACE
N 360°
W 270°
E 90°
S 180°
RESULTANT WINDS
BASED ON OBSERVATIONS MADE BY THE
MacGREGOR ARCTIC EXPEDITION
NEAR ETAH, GREENLAND
(78°20' N – 72° 42' W)
SEPTEMBER 1937 – JUNE 1938
ARROWS FLY WITH THE WIND
LENGTH OF ARROWS REPRESENT VELOCITY
IN METERS PER SECOND
(1 M.P.S. = 2.24 M.P.H.)
0 1 2 3 4 5
VELOCITY SCALE IN METERS PER SECOND
* 1 MONTH (JUNE 1938)
B.F.D.

FIGURE 3

FIGURE 4.—The base camp of the MacGregor Arctic Expedition at Reindeer Point, Greenland (Etah). The mountains in the left background are north, to the rear is east. The Greenland Ice Cap about 8 miles away was visible from the east window.

FIGURE 5.—Rain and snow gage. Note the rocks used to secure gage.

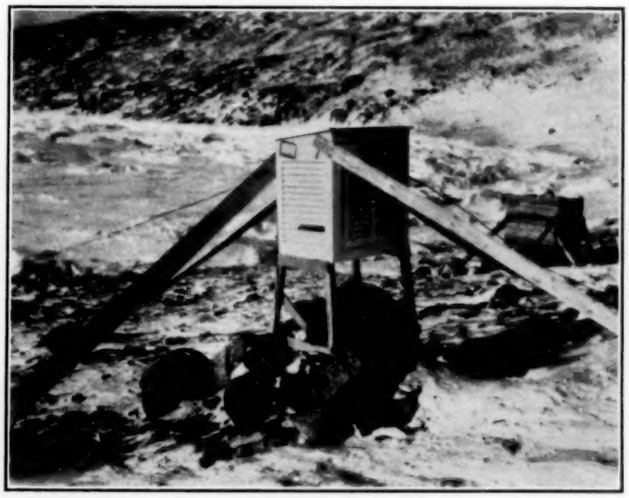

FIGURE 6.—Instrument and pilot-balloon observation shelters at the base camp. Note braces and rocks around both shelters to keep them from blowing away. Maximum wind recorded was about 80 miles per hour.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*

[All times are 75th meridian]

SEPTEMBER 1937—6 A. M.

| Date | Surface | | 500 m. | | 1,000 m. | | 1,500 m. | | 2,000 m. | | 3,000 m. | | 4,000 m. | | 5,000 m. | | 6,000 m. | | 7,000 m. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. |
| 11 | ne. | 8 | nw. | 2 | sw. | 6 | sw. | 5 | s. | 3 | ese. | 3 | sse. | 8 | sse. | 7 | s. | 11 | s. | 13 |
| 12 | Calm | | nw. | 2 | sw. | 2 | wsw. | 4 | | | | | | | | | | | | |
| 13[1] | | | | | | | | | | | | | | | | | | | | |
| 14[1] | | | | | | | | | | | | | | | | | | | | |
| 15[1] | | | | | | | | | | | | | | | | | | | | |
| 16 | e. | 14 | ne. | 23 | nne. | 31 | | | | | | | | | | | | | | |
| 17 | nne. | 8 | ne. | 22 | | | | | | | | | | | | | | | | |
| 18 | ne. | 4 | ssw. | 2 | ssw. | 3 | ese. | 1 | sw. | 2 | Calm | | nne. | 7 | nne. | 15 | n. | 17 | nne. | 19 |
| 19[2] | | | | | | | | | | | | | | | | | | | | |
| 20[3] | | | | | | | | | | | | | | | | | | | | |
| 21[1] | | | | | | | | | | | | | | | | | | | | |
| 22 | ne. | 2 | ne. | 5 | n. | 10 | n. | 10 | n. | 12 | n. | 9 | n. | 15 | | | | | | |
| 23 | ene. | 4 | n. | 9 | nnw. | 8 | n. | 8 | nw. | 5 | wnw. | 8 | wnw. | 11 | w. | 12 | w. | 15 | wnw. | 13 |
| 24[1] | | | | | | | | | | | | | | | | | | | | |
| 25[3] | | | | | | | | | | | | | | | | | | | | |
| 26[1] | | | | | | | | | | | | | | | | | | | | |
| 27[3] | | | | | | | | | | | | | | | | | | | | |
| 28[2] | | | | | | | | | | | | | | | | | | | | |
| 29[1] | | | | | | | | | | | | | | | | | | | | |
| 30 | ne. | 4 | ne. | 12 | nne. | 12 | nne. | 19 | n. | 10 | n. | 14 | | | | | | | | |

SEPTEMBER 1937—6 P. M.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | e. | 4 | ne. | 14 | ne. | 22 | ne. | 15 | ne. | 15 | | | | | | | | | | |
| 11 | ene. | 4 | ne. | 12 | ne. | 4 | ne. | 5 | ene. | 3 | ene. | 3 | e. | 7 | ese. | 11 | se. | 12 | se. | 10 |
| 12[1] | | | | | | | | | | | | | | | | | | | | |
| 13 | e. | 4 | ne. | 19 | nne. | 10 | ne. | 10 | ene. | 6 | ene. | 14 | e. | 8 | | | | | | |
| 14[1] | | | | | | | | | | | | | | | | | | | | |
| 15[1] | | | | | | | | | | | | | | | | | | | | |
| 16 | e. | 12 | nne. | 21 | nne. | 28 | nne. | 26 | | | | | | | | | | | | |
| 17 | nne. | 6 | ne. | 4 | n. | 2 | ne. | 3 | ene. | 3 | ne. | 5 | ne. | 4 | ne. | 11 | n. | 17 | | |
| 18[1] | | | | | | | | | | | | | | | | | | | | |
| 19[1] | | | | | | | | | | | | | | | | | | | | |
| 20[4] | | | | | | | | | | | | | | | | | | | | |
| 21[1] | | | | | | | | | | | | | | | | | | | | |
| 22 | ne. | 7 | n. | 10 | nnw. | 12 | nnw. | 10 | nnw. | 10 | nnw. | 16 | nnw. | 14 | | | | | | |
| 23[1] | | | | | | | | | | | | | | | | | | | | |
| 24[3] | | | | | | | | | | | | | | | | | | | | |
| 25[2] | | | | | | | | | | | | | | | | | | | | |
| 26 | sw. | 7 | s. | 7 | s. | 9 | | | | | | | | | | | | | | |
| 27[3] | | | | | | | | | | | | | | | | | | | | |
| 28 | ese. | 6 | ne. | 17 | nne. | 22 | nne. | 15 | ene. | 13 | | | | | | | | | | |
| 29 | ne. | 5 | n. | 12 | nne. | 8 | nne. | 13 | nne. | 10 | nne. | 16 | | | | | | | | |
| 30 | e. | 4 | nne. | 14 | n. | 12 | n. | 12 | n. | 20 | n. | 18 | | | | | | | | |

OCTOBER 1937—6 A. M.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ne. | 5 | ne. | 10 | nne. | 11 | nne. | 13 | nne. | 11 | | | | | | | | | | |
| 2 | se. | 3 | s. | 8 | sw. | 12 | sw. | 15 | | | | | | | | | | | | |
| 3 | wsw. | 2 | ssw. | 5 | sw. | 4 | sw. | 1 | | | | | | | | | | | | |
| 4[2] | | | | | | | | | | | | | | | | | | | | |
| 5[2] | | | | | | | | | | | | | | | | | | | | |
| 6 | ne. | 3 | ene. | 3 | nnw. | 2 | nw. | 5 | nnw. | 10 | nnw. | 9 | nnw. | 18 | nnw. | 22 | nnw. | 23 | | |
| 7[1] | | | | | | | | | | | | | | | | | | | | |
| 8[2] | | | | | | | | | | | | | | | | | | | | |
| 9 | ene. | 8 | ne. | 16 | nne. | 18 | nne. | 9 | ne. | 24 | | | | | | | | | | |
| 10[3] | | | | | | | | | | | | | | | | | | | | |
| 11 | ne. | 3 | ene. | 3 | ne. | 1 | ese. | 1 | se. | 3 | ssw. | 5 | sw. | 5 | | | | | | |
| 12[1] | | | | | | | | | | | | | | | | | | | | |
| 13 | e. | 3 | ne. | 15 | | | | | | | | | | | | | | | | |
| 14[3] | | | | | | | | | | | | | | | | | | | | |
| 15 | ene. | 6 | ne. | 12 | nne. | 12 | n. | 13 | nw. | 9 | nnw. | 16 | | | | | | | | |
| 16 | e. | 10 | ne. | 16 | ne. | 20 | | | | | | | | | | | | | | |
| 17 | ne. | 5 | ne. | 13 | ne. | 10 | ene. | 14 | | | | | | | | | | | | |
| 18 | e. | 7 | ne. | 16 | ne. | 27 | | | | | | | | | | | | | | |
| 19 | ese. | 4 | ne. | 16 | ne. | 20 | ne. | 18 | nne. | 17 | nne. | 10 | | | | | | | | |
| 20 | nne. | 5 | ne. | 10 | | | | | | | | | | | | | | | | |
| 21 | wnw. | 2 | ssw. | 4 | | | | | | | | | | | | | | | | |
| 22[4] | | | | | | | | | | | | | | | | | | | | |
| 23[1] | | | | | | | | | | | | | | | | | | | | |
| 24[5] | | | | | | | | | | | | | | | | | | | | |
| 25[1] | | | | | | | | | | | | | | | | | | | | |
| 26 | ne. | 5 | ne. | 3 | ene. | 2 | wsw. | 1 | w. | 4 | nw. | 5 | | | | | | | | |
| 27 | e. | 3 | e. | 3 | ene. | 4 | nne. | 5 | n. | 3 | Calm | | nw. | 6 | | | | | | |
| 28[1] | | | | | | | | | | | | | | | | | | | | |
| 29[5] | | | | | | | | | | | | | | | | | | | | |
| 30 | ene. | 8 | ne | 8 | nne. | 6 | ne. | 1 | n. | 2 | wnw. | 4 | w. | 6 | wsw. | 9 | | | | |
| 31 | nne. | 12 | nne. | 10 | | | | | | | | | | | | | | | | |

[1] None. Low clouds.
[2] None. Snowing.
[3] None. Misting.
[4] None. Sleeting.
[5] None. Light snow.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

OCTOBER 1937—6 P. M.

| Date | Surface | | 500 m. | | 1,000 m. | | 1,500 m. | | 2,000 m. | | 3,000 m. | | 4,000 m. | | 5,000 m. | | 6,000 m. | | 7,000 m. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. |
| 1 | ne. | 4 | n. | 6 | n. | 5 | n. | 4 | nnw. | 2 | nnw. | 7 | nnw. | 11 | | | | | | |
| 2 [1] | | | | | | | | | | | | | | | | | | | | |
| 3 | ne. | 2 | Calm | | e. | 3 | ese. | 4 | se. | 4 | w. | 3 | sw. | 5 | wsw. | 6 | wsw. | 8 | | |
| 4 [1] | | | | | | | | | | | | | | | | | | | | |
| 5 | e. | 2 | ne. | 9 | nne. | 18 | n. | 13 | n. | 17 | | | | | | | | | | |
| 6 [1] | | | | | | | | | | | | | | | | | | | | |
| 7 [1] | | | | | | | | | | | | | | | | | | | | |
| 8 [2] | | | | | | | | | | | | | | | | | | | | |
| 9 | e. | 12 | ne. | 18 | nne. | 21 | ne. | 24 | ne. | 24 | | | | | | | | | | |
| 10 [1] | | | | | | | | | | | | | | | | | | | | |
| 11 | ne. | 3 | n. | 2 | wsw. | 2 | s. | 2 | | | | | | | | | | | | |
| 12 [1] | | | | | | | | | | | | | | | | | | | | |
| 13 [2] | | | | | | | | | | | | | | | | | | | | |
| 14 | ene. | 7 | ne. | 19 | nne. | 21 | nne. | 19 | | | | | | | | | | | | |
| 15 [2] | | | | | | | | | | | | | | | | | | | | |
| 16 [6] | | | | | | | | | | | | | | | | | | | | |
| 17 | ese. | 5 | ne. | 16 | ne. | 30 | ne. | 6 | ene. | 17 | | | | | | | | | | |
| 18 [1] | | | | | | | | | | | | | | | | | | | | |
| 19 | e. | 4 | ne. | 20 | nne. | 10 | nne. | 12 | ne. | 10 | | | | | | | | | | |
| 20 | ne. | 1 | se. | 2 | nne. | 1 | nw. | 2 | nnw. | 5 | nnw. | 7 | nw. | 11 | | | | | | |
| 21 [3] | | | | | | | | | | | | | | | | | | | | |
| 22 [1] | | | | | | | | | | | | | | | | | | | | |
| 23 [1] | | | | | | | | | | | | | | | | | | | | |
| 24 [1] | | | | | | | | | | | | | | | | | | | | |
| 25 [1] | | | | | | | | | | | | | | | | | | | | |
| 26 [7] | | | | | | | | | | | | | | | | | | | | |
| 27 | ne. | 5 | ene. | 3 | nne. | 10 | nne. | 1 | sw. | 1 | wsw. | 2 | | | | | | | | |
| 28 | nne. | 2 | sw. | 3 | ssw. | 8 | sw. | 9 | | | | | | | | | | | | |
| 29 | ene. | 5 | nne. | 8 | ne. | 2 | sw. | 1 | | | | | | | | | | | | |
| 30 [7] | | | | | | | | | | | | | | | | | | | | |
| 31 [7] | | | | | | | | | | | | | | | | | | | | |

NOVEMBER 1937—12 NOON

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | none | | | | | | | | | | | | | | | |
| 2 | ese. | 4 | ne. | 18 | ne. | 9 | ne. | 8 | ene. | 4 | ene. | 5 | | | | | | | | |
| 3 | e. | 7 | ne. | 15 | | | | | | | | | | | | | | | | |
| 4 | ne. | 2 | ene. | 5 | ne. | 4 | n. | 3 | ene. | 2 | e. | 6 | | | | | | | | |
| 5 | e. | 7 | ne. | 20 | ne. | 4 | nne. | 3 | ene. | 6 | | | | | | | | | | |
| 6 [2] | | | | | | | | | | | | | | | | | | | | |
| 7 [2] | | | | | | | | | | | | | | | | | | | | |
| 8 [2] | | | | | | | | | | | | | | | | | | | | |
| 9 | ne. | 3 | ne. | 8 | ne. | 10 | ne. | 1 | | | | | | | | | | | | |
| 10 [2] | | | | | | | | | | | | | | | | | | | | |
| 11 [2] | | | | | | | | | | | | | | | | | | | | |
| 12 | ene. | 3 | ne. | 17 | ne. | 16 | | | | | | | | | | | | | | |
| 13 | ene. | 4 | ene. | 5 | n. | 10 | w. | 3 | sw. | 7 | sw. | 6 | sw. | 6 | | | | | | |
| 14 [8] | | | | | | | | | | | | | | | | | | | | |
| 15 | Calm | | ssw. | 3 | wnw. | 1 | nw. | 3 | wnw. | 5 | | | | | | | | | | |
| 16 [2] | | | | | | | | | | | | | | | | | | | | |
| 17 [2] | | | | | | | | | | | | | | | | | | | | |
| 18 [2] | | | | | | | | | | | | | | | | | | | | |
| 19 [2] | | | | | | | | | | | | | | | | | | | | |
| 20 [2] | | | | | | | | | | | | | | | | | | | | |
| 21 [2] | | | | | | | | | | | | | | | | | | | | |
| 22 [2] | | | | | | | | | | | | | | | | | | | | |
| 23 [2] | | | | | | | | | | | | | | | | | | | | |
| 24 [2] | | | | | | | | | | | | | | | | | | | | |
| 25 | ne. | 2 | ne. | 2 | ese. | 3 | se. | 5 | se. | 9 | se. | 12 | | | | | | | | |
| 26 | ne. | 2 | ne. | 4 | se. | 2 | ssw. | 5 | sw. | 10 | ssw. | 11 | | | | | | | | |
| 27 [9] | | | | | | | | | | | | | | | | | | | | |
| 28 [10] | | | | | | | | | | | | | | | | | | | | |
| 29 | ne. | 2 | s. | 4 | s. | 9 | s. | 8 | | | | | | | | | | | | |
| 30 | nne. | 3 | ne. | 1 | wsw. | 2 | | | | | | | | | | | | | | |

[1] None. Low clouds.
[2] None. Snowing.
[3] None. Light snow.
[6] None. High surface winds.
[7] None. Strong surface winds.
[8] None.
[9] None. Cloudy.
[10] None. Cloudy with high surface winds.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

DECEMBER 1937—12 NOON

| Date | Surface | | 500 m. | | 1,000 m. | | 1,500 m. | | 2,000 m. | | 3,000 m. | | 4,000 m. | | 5,000 m. | | 6,000 m. | | 7,000 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. |
| 1 [11] | | | | | | | | | | | | | | | | | | | | |
| 2 [12] | | | | | | | | | | | | | | | | | | | | |
| 3 | ne. | 4 | ene. | 2 | e. | 1 | wsw. | 1 | ssw. | 1 | | | | | | | | | | |
| 4 | ne. | 7 | nne. | 9 | nne. | 1 | nw. | 1 | wsw. | 6 | | | | | | | | | | |
| 5 | ese. | 1 | s. | 12 | | | | | | | | | | | | | | | | |
| 6 | ne. | 4 | ne. | 2 | sse. | 4 | | | | | | | | | | | | | | |
| 7 | ssw. | 1 | ssw. | 5 | | | | | | | | | | | | | | | | |
| 8 | e. | 1 | ssw. | 4 | s. | 4 | s. | 1 | wsw. | 2 | | | | | | | | | | |
| 9 | ene. | 5 | ene. | 5 | ne. | 4 | nnw. | 5 | nnw. | 7 | nnw. | 9 | nw. | 8 | | | | | | |
| 10 | e. | 5 | ne. | 14 | n. | 10 | n. | 16 | n. | 14 | | | | | | | | | | |
| 11 | ssw. | 1 | ssw. | 8 | ssw. | 14 | ssw. | 14 | | | | | | | | | | | | |
| 12 | e. | 1 | s. | 3 | S. | 9 | s. | 10 | | | | | | | | | | | | |
| 13 [13] | | | | | | | | | | | | | | | | | | | | |
| 14 | se. | 1 | sse. | 3 | s. | 8 | s. | 7 | s. | 7 | | | | | | | | | | |
| 15 [2] | | | | | | | | | | | | | | | | | | | | |
| 16 | ene. | 1 | s. | 3 | s. | 9 | | | | | | | | | | | | | | |
| 17 [11] | | | | | | | | | | | | | | | | | | | | |
| 18 [14] | | | | | | | | | | | | | | | | | | | | |
| 19 | ne. | 4 | ene. | 1 | | | | | | | | | | | | | | | | |
| 20 | ene. | 5 | sse. | 1 | ssw. | 5 | sw. | 2 | s. | 1 | sse. | 2 | sse. | 3 | | | | | | |
| 21 | ne. | 2 | sse. | 1 | s. | 2 | sse. | 7 | se. | 4 | se. | 4 | se. | 4 | ese. | 4 | | | | |
| 22 | ne. | 2 | ene. | 3 | sse. | 5 | s. | 5 | s. | 10 | s. | 8 | | | | | | | | |
| 23 | ne. | 2 | se. | 2 | s. | 6 | s. | 5 | s. | 8 | s. | 8 | s. | 18 | | | | | | |
| 24 | e. | 1 | s. | 5 | | | | | | | | | | | | | | | | |
| 25 [15] | | | | | | | | | | | | | | | | | | | | |
| 26 | ne. | 4 | e. | 2 | ssw. | 2 | | | | | | | | | | | | | | |
| 27 | ene. | 2 | sw. | 3 | sw. | 6 | wnw. | 6 | nnw. | 5 | n. | 4 | s. | 2 | sse. | 4 | | | | |
| 28 [1] | | | | | | | | | | | | | | | | | | | | |
| 29 | ne. | 1 | ene. | 9 | nne. | 10 | n. | 10 | | | | | | | | | | | | |
| 30 | ne. | 2 | ene. | 8 | nne. | 12 | | | | | | | | | | | | | | |
| 31 [3] | | | | | | | | | | | | | | | | | | | | |

JANUARY 1938—12 NOON

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 [13] | | | | | | | | | | | | | | | | | | | | |
| 2 | ne. | 3 | ne. | 2 | sse. | 2 | sse. | 11 | sse. | 13 | s. | 18 | | | | | | | | |
| 3 | ene. | 4 | s. | 4 | s. | 3 | | | | | | | | | | | | | | |
| 4 | nne. | 1 | ssw. | 4 | sw. | 5 | wsw. | 2 | wnw. | 3 | nw. | 5 | nnw. | 9 | | | | | | |
| 5 | ne. | 7 | nne. | 7 | n. | 5 | nnw. | 4 | nnw. | 5 | nw. | 6 | nw. | 9 | | | | | | |
| 6 | wsw. | 5 | s. | 6 | | | | | | | | | | | | | | | | |
| 7 | ne. | 1 | ne. | 12 | nne. | 13 | n. | 18 | | | | | | | | | | | | |
| 8 | ne. | 3 | ne. | 1 | nnw. | 6 | nw. | 8 | nw. | 13 | nw. | 17 | | | | | | | | |
| 9 [2] | | | | | | | | | | | | | | | | | | | | |
| 10 | w. | 1 | ssw. | 4 | nw. | 4 | nw. | 11 | | | | | | | | | | | | |
| 11 | ne. | 2 | ne. | 7 | nne. | 4 | sse. | 1 | wsw. | 2 | | | | | | | | | | |
| 12 [2] | | | | | | | | | | | | | | | | | | | | |
| 13 | ne. | 5 | e. | 2 | ene. | 6 | ene. | 7 | e. | 7 | | | | | | | | | | |
| 14 [1] | | | | | | | | | | | | | | | | | | | | |
| 15 [1] | | | | | | | | | | | | | | | | | | | | |
| 16 | ne. | 1 | s. | 3 | ssw. | 5 | sw. | 4 | wsw. | 4 | w. | 7 | | | | | | | | |
| 17 | ene. | 6 | e. | 4 | nne. | 7 | nnw. | 3 | nnw. | 6 | | | | | | | | | | |
| 18 | Calm | | n. | 3 | nnw. | 8 | nnw. | 9 | nw. | 8 | nw. | 11 | | | | | | | | |
| 19 | nne. | 4 | nw. | 1 | ese. | 1 | Calm | | Calm | | | | | | | | | | | |
| 20 | ene. | 2 | ssw. | 2 | ssw. | 4 | sw. | 6 | sw. | 11 | | | | | | | | | | |
| 21 [2] | | | | | | | | | | | | | | | | | | | | |
| 22 | s. | 4 | s. | 8 | | | | | | | | | | | | | | | | |
| 23 [2] | | | | | | | | | | | | | | | | | | | | |
| 24 | ne. | 4 | sse. | 2 | sse. | 3 | ese. | 3 | ese. | 4 | | | | | | | | | | |
| 25 | ene. | 1 | sse. | 2 | s. | 6 | s. | 6 | s. | 12 | sse. | | | | | | | | | |
| 26 [2] | | | | | | | | | | | | | | | | | | | | |
| 27 [2] | | | | | | | | | | | | | | | | | | | | |
| 28 | ne. | 5 | ene. | 2 | ene. | 5 | e. | 5 | e. | 10 | | | | | | | | | | |
| 29 | ne. | 6 | ne. | 11 | nne. | 13 | nne. | 15 | | | | | | | | | | | | |
| 30 | ene. | 5 | nw. | 19 | ne. | 19 | | | | | | | | | | | | | | |
| 31 | e. | 1 | ssw. | 5 | ssw. | 6 | s. | 7 | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ne. | 3 | ene. | 5 | ne. | 6 | ene. | 6 | se. | 8 | se. | 12 | | | | | | | | |
| 2 | ene. | 5 | ne. | 7 | ne. | 6 | n. | 2 | n. | 2 | ne. | 5 | ne. | 9 | | | | | | |
| 3 | se. | 1 | ene. | 3 | ne. | 2 | e. | 3 | ese. | 4 | se. | 5 | se. | 8 | | | | | | |
| 4 | ne. | 5 | ne. | 6 | ne. | 6 | e. | 3 | ese. | 7 | ese. | 11 | se. | 13 | | | | | | |
| 5 | ne. | 3 | ne. | 7 | ne. | 2 | e. | 5 | e. | 5 | | | | | | | | | | |
| 6 | ne. | 5 | ne. | 11 | ne. | 22 | nne. | 10 | n. | 8 | nw. | 4 | | | | | | | | |
| 7 | nne. | 10 | e. | 4 | ssw. | 3 | e. | 7 | e. | 8 | ese. | 9 | | | | | | | | |
| 8 | wnw. | 1 | sw. | 4 | | | | | | | | | | | | | | | | |
| 9 [1] | | | | | | | | | | | | | | | | | | | | |
| 10 | ne. | 5 | ne. | 8 | nne. | 7 | ne. | 2 | ne. | 3 | ene. | 5 | | | | | | | | |
| 11 [6] | | | | | | | | | | | | | | | | | | | | |
| 12 | ne. | 5 | ene. | 5 | e. | 1 | ene. | 2 | se. | 3 | ssw. | 2 | s. | 3 | | | | | | |
| 13 | e. | 6 | ne. | 11 | nne. | 19 | nne. | 14 | ene. | 4 | nw. | 5 | n. | 14 | | | | | | |
| 14 [2] | | | | | | | | | | | | | | | | | | | | |
| 15 [2] | | | | | | | | | | | | | | | | | | | | |
| 16 | ne. | 3 | ne. | 1 | e. | 7 | ese. | 4 | | | | | | | | | | | | |
| 17 | nnw. | 1 | ene. | 3 | ene. | 4 | | | | | | | | | | | | | | |
| 18 [2] | | | | | | | | | | | | | | | | | | | | |
| 19 [2] | | | | | | | | | | | | | | | | | | | | |
| 20 | Calm | | ssw. | 7 | ssw. | 7 | wsw. | 2 | ssw. | 5 | sw. | 10 | | | | | | | | |
| 21 [14] | | | | | | | | | | | | | | | | | | | | |
| 22 | ene. | 7 | ne. | 13 | | | | | | | | | | | | | | | | |
| 23 | ne. | 1 | s. | 7 | | | | | | | | | | | | | | | | |
| 24 | ne. | 3 | ene. | 4 | ne. | 2 | e. | 2 | e. | 7 | ne. | 1 | | | | | | | | |
| 25 | ene. | 7 | ene. | 7 | ene. | 6 | | | | | | | | | | | | | | |
| 26 | ene. | 10 | ne. | 16 | nne. | 13 | n. | 15 | | | | | | | | | | | | |
| 27 [2] | | | | | | | | | | | | | | | | | | | | |
| 28 [2] | | | | | | | | | | | | | | | | | | | | |

[1] Low clouds.
[2] None. Snowing.
[6] None. High surface winds.
[11] None. High wind.
[12] None. Blowing snow.
[13] None. Low clouds; snowing.
[14] None. High winds; blowing snow.
[15] None. Surface winds.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

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| Date | Surface | | 500 m. | | 1,000 m. | | 1,500 m. | | 2,000 m. | | 3,000 m. | | 4,000 m. | | 5,000 m. | | 6,000 m. | | 7,000 m. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. |
| 1 | ne. | 5 | ene. | 7 | e. | 2 | e. | 5 | ese. | 8 | se. | 10 | ese. | 15 | | | | | | |
| 2 | ene. | 1 | ne. | 1 | s. | 5 | s. | 6 | s. | 4 | s. | 6 | se. | 7 | | | | | | |
| 3 | ne. | 1 | ene. | 6 | ne. | 1 | ene. | 1 | e. | 2 | se. | 6 | se. | 14 | | | | | | |
| 4 | ne. | 5 | nne. | 4 | ne. | 6 | ne. | 6 | e. | 6 | e. | 8 | e. | 7 | | | | | | |
| 5 | ne. | 7 | ene. | 12 | ne. | 8 | ene. | 9 | | | | | | | | | | | | |
| 6 | e. | 12 | ne. | 46 | | | | | | | | | | | | | | | | |
| 7 | nne. | 4 | ene. | 1 | s. | 4 | sse. | 5 | sse, | 8 | se. | 13 | se. | 23 | | | | | | |
| 8 | n. | 1 | wnw. | 1 | ssw. | 4 | | | | | | | | | | | | | | |
| 9 | sse. | 1 | sw. | 4 | s. | 1 | nne. | 1 | ne. | 3 | | | | | | | | | | |
| 10 | ene. | 10 | ne. | 20 | nne. | 20 | nne. | 20 | | | | | | | | | | | | |
| 11 | ene. | 4 | ene. | 14 | ne. | 15 | e. | 7 | ne. | 3 | s. | 3 | | | | | | | | |
| 12 | e. | 10 | ne. | 18 | nne. | 22 | nne. | 16 | nne. | 14 | | | | | | | | | | |
| 13 | ene. | 5 | ese. | 1 | nw. | 1 | n. | 2 | n. | 3 | n. | 4 | n. | 6 | nnw. | 12 | | | | |
| 14 [9] | | | | | | | | | | | | | | | | | | | | |
| 15 | ene. | 5 | ne. | 1 | sse. | 3 | sse. | 6 | s. | 10 | | | | | | | | | | |
| 16 | ene. | 3 | e. | 2 | se. | 5 | sse. | 8 | sse. | 13 | se. | 21 | | | | | | | | |
| 17 | ne. | 5 | ene. | 6 | ese. | 3 | Calm | | sw. | 2 | sse. | 2 | | | | | | | | |
| 18 [9] | | | | | | | | | | | | | | | | | | | | |
| 19 | se. | 3 | ssw. | 7 | | | | | | | | | | | | | | | | |
| 20 | ene. | 2 | ne. | 4 | ne. | 1 | Calm | | wsw. | 2 | sw. | 4 | | | | | | | | |
| 21 | e. | 8 | ne. | 12 | ne. | 15 | sse. | 1 | ene. | 2 | s. | 2 | s. | 5 | | | | | | |
| 22 [16] | | | | | | | | | | | | | | | | | | | | |
| 23 [3] | | | | | | | | | | | | | | | | | | | | |
| 24 | e | 5 | ne. | 15 | ne. | 20 | ne. | 5 | ne. | 5 | | | | | | | | | | |
| 25 | ene. | 10 | ne. | 16 | nne. | 22 | nne. | 22 | nne. | 23 | | | | | | | | | | |
| 26 | ene. | 7 | ne. | 17 | nne. | 22 | | | | | | | | | | | | | | |
| 27 [9] | | | | | | | | | | | | | | | | | | | | |
| 28 [2] | | | | | | | | | | | | | | | | | | | | |

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| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 [9] | | | | | | | | | | | | | | | | | | | | |
| 2 | wsw. | 1 | ssw. | 7 | ssw. | 4 | n. | 4 | nw. | 6 | | | | | | | | | | |
| 3 | nne. | 7 | nne. | 7 | ne. | 4 | | | | | | | | | | | | | | |
| 4 [9] | | | | | | | | | | | | | | | | | | | | |
| 5 | ene. | 7 | ne. | 19 | ne. | 6 | ene. | 16 | | | | | | | | | | | | |
| 6 | ne. | 4 | ne. | 10 | ne. | 19 | ne. | 13 | ne. | 10 | | | | | | | | | | |
| 7 [9] | | | | | | | | | | | | | | | | | | | | |
| 8 | ne. | 4 | ene. | 4 | ssw. | 5 | sw. | 5 | | | | | | | | | | | | |
| 9 | e. | 2 | ssw. | 5 | sw. | 6 | s. | 8 | s. | 4 | | | | | | | | | | |
| 10 | ene. | 2 | s. | 2 | s. | 5 | | | | | | | | | | | | | | |
| 11 | ese. | 2 | ssw. | 7 | s. | 11 | | | | | | | | | | | | | | |
| 12 | ene. | 10 | nne. | 18 | n. | 31 | | | | | | | | | | | | | | |
| 13 [9] | | | | | | | | | | | | | | | | | | | | |
| 14 [9] | | | | | | | | | | | | | | | | | | | | |
| 15 | ese. | 1 | se. | 1 | sse. | 8 | s. | 15 | | | | | | | | | | | | |
| 16 [1] | | | | | | | | | | | | | | | | | | | | |
| 17 [1] | | | | | | | | | | | | | | | | | | | | |
| 18 [1] | | | | | | | | | | | | | | | | | | | | |
| 19 | ene. | 5 | ene. | 8 | ne. | 8 | nne. | 12 | n. | 12 | | | | | | | | | | |
| 20 [13] | | | | | | | | | | | | | | | | | | | | |
| 21 | ese. | 5 | ne. | 20 | nne. | 26 | nne. | 26 | nne. | 28 | | | | | | | | | | |
| 22 | ene. | 6 | ne. | 14 | nne. | 15 | nne. | 30 | n. | 31 | | | | | | | | | | |
| 23 | ene. | 10 | nne. | 7 | nne. | 25 | nne. | 17 | | | | | | | | | | | | |
| 24 [1] | | | | | | | | | | | | | | | | | | | | |
| 25 | Calm | | ssw. | 1 | w. | 2 | n. | 4 | n. | 5 | n. | 8 | n. | 10 | n. | 11 | n. | 13 | n. | 14 |
| 26 | e. | 1 | ene. | 8 | nne. | 1 | Calm | | s. | 2 | se. | 2 | nnw. | 8 | n. | 12 | nnw. | 13 | nw. | 14 |
| 27 | e. | 1 | ssw. | 3 | sw. | 2 | nne. | 2 | n. | 4 | | | | | | | | | | |
| 28 | Calm | | ssw. | 1 | ne. | 1 | nne. | 6 | nnw. | 5 | nnw. | 5 | nnw. | 6 | nnw. | 5 | n. | 4 | n. | 4 |
| 29 | wsw. | 2 | ssw. | 7 | | | | | | | | | | | | | | | | |
| 30 | wnw. | 1 | sw. | 5 | nnw. | 3 | nw. | 5 | nw. | 6 | nw. | 7 | nw. | 8 | nw. | 9 | wnw. | 12 | wnw. | 12 |
| 31 | e. | 3 | ne. | 15 | nne. | 14 | nne. | 30 | | | | | | | | | | | | |

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| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 [9] | | | | | | | | | | | | | | | | | | | | |
| 2 | ne. | 1 | e. | 1 | ssw. | 3 | w. | 5 | | | | | | | | | | | | |
| 3 | e. | 10 | ne. | 19 | | | | | | | | | | | | | | | | |
| 4 [7] | | | | | | | | | | | | | | | | | | | | |
| 5 | ne. | 3 | ssw. | 1 | | | | | | | | | | | | | | | | |
| 6 | e. | 12 | ne. | 22 | ne. | 29 | | | | | | | | | | | | | | |
| 7 [10] | | | | | | | | | | | | | | | | | | | | |
| 8 [3] | | | | | | | | | | | | | | | | | | | | |
| 9 | ne. | 2 | sse. | 1 | s. | 1 | ssw. | 7 | s. | 7 | s. | 4 | s. | 3 | sse. | 5 | | | | |
| 10 | ene. | 2 | ssw. | 1 | s. | 4 | s. | 4 | s. | 6 | s. | 4 | ene. | 1 | e. | 1 | e. | 2 | ne. | 4 |
| 11 | ne. | 2 | ene. | 4 | se. | 3 | s. | 4 | sse. | 5 | s. | 10 | s. | 10 | sse. | 10 | sse. | 12 | | |
| 12 | ne. | 2 | sse. | 2 | e. | 2 | e. | 4 | s. | 10 | s. | 14 | | | | | | | | |
| 13 [1] | | | | | | | | | | | | | | | | | | | | |
| 14 [9] | | | | | | | | | | | | | | | | | | | | |
| 15 [1] | | | | | | | | | | | | | | | | | | | | |
| 16 | ne. | 4 | s. | 4 | ssw. | 5 | | | | | | | | | | | | | | |
| 17 | ssw. | 4 | ssw. | 8 | | | | | | | | | | | | | | | | |
| 18 [1] | | | | | | | | | | | | | | | | | | | | |
| 19 | ne. | 7 | ne. | 13 | ne. | 19 | ne. | 9 | | | | | | | | | | | | |
| 20 [9] | | | | | | | | | | | | | | | | | | | | |
| 21 | e. | 10 | ene. | 6 | | | | | | | | | | | | | | | | |
| 22 | e. | 5 | nne. | 14 | nne. | 21 | nne. | 25 | nne. | 23 | nne. | 26 | | | | | | | | |
| 23 | ene. | 3 | ene. | 4 | nne. | 12 | nne. | 11 | n. | 12 | n. | 15 | n. | 15 | | | | | | |
| 24 | ne. | 2 | ssw. | 5 | s. | 11 | | | | | | | | | | | | | | |
| 25 | ene. | 1 | ne. | 5 | ne. | 2 | nne. | 4 | nne. | 2 | n. | 4 | nnw. | 7 | nnw. | 10 | nnw. | 13 | nnw. | 15 |
| 26 | ese. | 1 | ssw. | 8 | sw. | 2 | wnw. | 2 | wnw. | 3 | nnw. | 8 | nnw. | 13 | n. | 20 | n. | 24 | | |
| 27 | ene. | 1 | ne. | 2 | sse. | 1 | Calm | | nw. | 3 | nnw. | 5 | nnw. | 6 | nnw. | 6 | nnw. | 8 | nw. | 12 |
| 28 | Calm | | ssw. | 7 | sw. | 7 | w. | 4 | nw. | 4 | | | | | | | | | | |
| 29 | ssw. | 2 | ssw. | 9 | sw. | 6 | se. | 1 | w. | 5 | wsw. | 10 | wsw. | 10 | | | | | | |
| 30 | nne. | 1 | n. | 10 | n. | 12 | nne. | 12 | n. | 9 | | | | | | | | | | |
| 31 | ene. | 6 | ne. | 15 | ne. | 17 | nne. | 20 | nne. | 18 | | | | | | | | | | |

[1] None. Low clouds. [3] None. Snowing. [7] None. Strong surface winds. [10] None. Blowing snow. [16] None. High winds; blowing snow.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

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| Date | Surface | | 500 m. | | 1,000 m. | | 1,500 m. | | 2,000 m. | | 3,000 m. | | 4,000 m. | | 5,000 m. | | 6,000 m. | | 7,000 m. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. |
| 1 | ne. | 4 | ne. | 12 | ne. | 14 | ne. | 19 | nne. | 2 | | | | | | | | | | 5 |
| 2 | ne. | 1 | n. | 2 | nnw. | 7 | n. | 6 | n. | 7 | n. | 11 | n. | 9 | n. | 4 | ne. | 3 | nne. | |
| 3 | ene | 4 | ne. | 12 | nne. | 14 | nne. | 16 | nne. | 11 | n. | 10 | n. | 20 | n. | 4 | | | | |
| 4 | ene. | 4 | n. | 11 | n. | 13 | nnw. | 13 | | | | | | | | | | | | |
| 5 [12] | | | | | | | | | | | | | | | | | | | | |
| 6 | ne. | 6 | ne. | 10 | ne. | 6 | s. | 1 | ene. | 2 | ene. | 10 | ene. | 13 | ene. | 21 | | | | |
| 7 | ene. | 8 | ene. | 5 | ene. | 5 | e. | 6 | se. | 10 | ese. | 8 | se. | 10 | | | | | | |
| 8 | nne. | 3 | ene. | 9 | ne. | 7 | nne. | 5 | nne. | 4 | ene. | 16 | | | | | | | | |
| 9 | ene. | 3 | nne. | 3 | ne. | 4 | e. | 5 | ene. | 5 | ene. | 13 | ene. | 16 | ne. | 18 | | | | |
| 10 | ene. | 3 | ne. | 14 | ne. | 11 | ene. | 9 | ene. | 3 | e. | 4 | e. | 7 | ese. | 9 | e. | 12 | ese. | 9 |
| 11 | ene. | 2 | se. | 1 | sw. | 1 | nnw. | 1 | wnw. | 1 | ssw. | 2 | ssw. | 2 | se. | 3 | s. | 4 | s. | 6 |
| 12 | ene. | 10 | ne. | 23 | nne. | 22 | ne. | 32 | | | | | | | | | | | | |
| 13 | nnw. | 1 | wsw. | 3 | ssw. | 5 | | | | | | | | | | | | | | |
| 14 | s. | 2 | s. | 6 | s. | 10 | sse. | 9 | ene. | 6 | se. | 12 | ese. | 13 | ese. | 19 | | | | |
| 15 | e. | 1 | sse. | 2 | sse. | 6 | se. | 6 | se. | 6 | e. | 12 | ese. | 14 | ese. | 10 | | | | |
| 16 | e. | 10 | ene. | 12 | ne. | 15 | ne. | 16 | ne. | 16 | | | | | | | | | | |
| 17 | ne. | 5 | ene. | 6 | s. | 2 | s. | 3 | s. | 5 | sse. | 6 | s. | 7 | se. | 7 | ese. | 13 | ese. | 10 |
| 18 | nne. | 3 | ese. | 4 | sw. | 6 | | | | | | | | | | | | | | |
| 19 [2] | | | | | | | | | | | | | | | | | | | | |
| 20 [12] | | | | | | | | | | | | | | | | | | | | |
| 21 | ene. | 1 | ssw. | 4 | s. | 5 | s. | 7 | s. | 9 | s. | 6 | s. | 10 | | | | | | |
| 22 [2] | | | | | | | | | | | | | | | | | | | | |
| 23 [1] | | | | | | | | | | | | | | | | | | | | |
| 24 | ne. | 2 | nne. | 8 | nne. | 15 | nne. | 13 | | | | | | | | | | | | |
| 25 | s. | 2 | s. | 9 | | | | | | | | | | | | | | | | |
| 26 | e. | 5 | ne. | 19 | ne. | 17 | ene. | 6 | e. | 4 | | | | | | | | | | |
| 27 | nw. | 1 | sw. | 3 | sw. | 7 | ssw. | 6 | | | | | | | | | | | | |
| 28 | e. | 1 | wsw. | 2 | ssw. | 3 | s. | 2 | se. | 5 | se. | 4 | ese. | 6 | ese. | 8 | ese. | 8 | ese. | 12 |
| 29 | ene. | 5 | ne. | 8 | e. | 3 | sse. | 4 | sse. | 4 | s. | 5 | s. | 8 | ssw. | 11 | s. | 12 | s. | 9 |
| 30 [2] | | | | | | | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ene. | 5 | e. | 2 | nne. | 5 | nnw. | 3 | nnw. | 3 | nnw. | 5 | nnw. | 12 | nnw. | 9 | nnw. | 11 | nnw. | 10 |
| 2 | ene. | 4 | ene. | 11 | nne. | 6 | nne. | 19 | nne. | 10 | nne. | 18 | | | | | | | | |
| 3 | ne. | 4 | nnw. | 11 | nnw. | 13 | nnw. | 11 | nnw. | 10 | nw. | 11 | nw. | 12 | | | | | | |
| 4 | e. | 4 | nne. | 10 | nne. | 6 | ne. | 5 | | | | | | | | | | | | |
| 5 | ne. | 5 | ene. | 14 | ese. | 8 | | | | | | | | | | | | | | |
| 6 | ene. | 10 | ne. | 8 | ne. | 14 | | | | | | | | | | | | | | |
| 7 | ene. | 10 | ene. | 5 | ene. | 14 | e. | 6 | ese. | 5 | | | | | | | | | | |
| 8 [2] | | | | | | | | | | | | | | | | | | | | |
| 9 | ne. | 3 | e. | 6 | ene. | 4 | e. | 3 | ne. | 4 | ene. | 7 | ene. | 9 | ene. | 12 | ene. | 17 | ene. | 18 |
| 10 | e. | 5 | ne. | 13 | ne. | 22 | ne. | 12 | | | | | | | | | | | | |
| 11 [12] | | | | | | | | | | | | | | | | | | | | |
| 12 [2] | | | | | | | | | | | | | | | | | | | | |
| 13 | Calm | | ene. | 1 | wsw. | 1 | nw. | 3 | ne. | 1 | e. | 5 | | | | | | | | |
| 14 | ne. | 2 | ene. | 5 | e. | 5 | ese. | 6 | e. | 5 | ese. | 21 | ese. | 22 | ese. | 17 | e. | 20 | e. | 20 |
| 15 | ese. | 1 | s. | 4 | s. | 7 | s. | 8 | s. | 13 | s. | 7 | | | | | | | | |
| 16 | ene. | 4 | ne. | 19 | nne. | 11 | ne. | 13 | | | | | | | | | | | | |
| 17 | e. | 8 | ne. | 17 | nne. | 21 | nne. | 18 | | | | | | | | | | | | |
| 18 [2] | | | | | | | | | | | | | | | | | | | | |
| 19 [1] | | | | | | | | | | | | | | | | | | | | |
| 20 | ne. | 5 | e. | 7 | nne. | 6 | e. | 1 | e. | 2 | sse. | 5 | se. | 6 | sse. | 11 | sse. | 16 | s. | 18 |
| 21 [2] | | | | | | | | | | | | | | | | | | | | |
| 22 [2] | | | | | | | | | | | | | | | | | | | | |
| 23 | Calm | | e. | 3 | se. | 3 | ese. | 2 | se. | 8 | ese. | 4 | se. | 4 | se. | 3 | ese. | 6 | ese. | 7 |
| 24 | e. | 2 | nne. | 9 | n. | 9 | n. | 11 | nnw. | 7 | | | | | | | | | | |
| 25 [2] | | | | | | | | | | | | | | | | | | | | |
| 26 | ese. | 5 | ne. | 16 | ne. | 15 | ene. | 7 | e. | 6 | se. | 7 | | | | | | | | |
| 27 | ne. | 1 | ese. | 1 | sse. | 4 | ese. | 5 | ene. | 6 | e. | 6 | ene. | 12 | e. | 9 | e. | 9 | ene. | 6 |
| 28 | ne. | 2 | ne. | 7 | nne. | 6 | ne. | 3 | e. | 4 | ese. | 5 | e. | 7 | ese. | 5 | ese. | 2 | ene. | 1 |
| 29 | Calm | | ssw. | 4 | s. | 9 | s. | 7 | | | | | | | | | | | | |
| 30 | ene. | 3 | ene. | 11 | e. | 3 | sse. | 4 | s. | 6 | sse. | 7 | sse. | 7 | se. | 9 | sse. | 9 | se. | 11 |

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| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | e. | 5 | ene. | 26 | ne. | 16 | ne. | 15 | ne. | 18 | | | | | | | | | | |
| 2 [2] | | | | | | | | | | | | | | | | | | | | |
| 3 [1] | | | | | | | | | | | | | | | | | | | | |
| 4 [2] | | | | | | | | | | | | | | | | | | | | |
| 5 [1] | | | | | | | | | | | | | | | | | | | | |
| 6 | Calm | | sw. | 1 | wsw. | 2 | | | | | | | | | | | | | | |
| 7 | Calm | | wsw. | 1 | ssw. | 4 | w. | 4 | wnw. | 4 | wnw. | 14 | | | | | | | | |
| 8 | ne. | 1 | n. | 8 | nnw. | 11 | nnw. | 14 | nw. | 8 | nw. | 13 | nw. | 16 | nw. | 16 | nw. | 17 | | |
| 9 | nne. | 4 | nne. | 7 | nne. | 14 | nne. | 8 | nne. | 3 | | | | | | | | | | |
| 10 | ene. | 5 | ne. | 14 | nne. | 21 | nne. | 21 | | | | | | | | | | | | |
| 11 | e. | 5 | ne. | 15 | ne. | 14 | | | | | | | | | | | | | | |
| 12 | Calm | | sw. | 2 | ssw. | 7 | ssw. | 5 | ssw. | 3 | s. | 6 | sse. | 7 | sse. | 10 | sse. | 10 | sse. | 14 |
| 13 | Calm | | sw. | 1 | nne. | 3 | ene. | 4 | ene. | 5 | ene. | 4 | se. | 4 | ese. | 6 | ese. | 8 | sse. | 4 |
| 14 | Calm | | ssw. | 4 | s. | 11 | wsw. | 2 | sw. | 2 | nnw. | 2 | nnw. | 6 | nnw. | 8 | nnw. | 11 | nnw. | 15 |
| 15 | sw. | 2 | ssw. | 4 | | | | | | | | | | | | | | | | |
| 16 | Calm | | ssw. | 2 | s. | 7 | s. | 5 | s. | 4 | ssw. | 2 | wnw. | 2 | w. | 3 | w. | 5 | wnw. | 8 |
| 17 | sw. | 1 | sw. | 3 | s. | 10 | ssw. | 7 | ssw. | 5 | s. | 9 | wsw. | 6 | | | | | | |
| 18 | sw. | 1 | ene. | 2 | ene. | 1 | e. | 1 | | | | | | | | | | | | |
| 19 | ene. | 5 | ne. | 16 | nne. | 14 | ne. | 11 | nne. | 3 | w. | 1 | w. | 5 | w. | 6 | wsw. | 10 | wsw. | 12 |
| 20 | ene. | 5 | ne. | 15 | ne. | 13 | e. | 6 | se. | 1 | ese. | 2 | sse. | 4 | s. | 6 | ssw. | 12 | s. | 11 |
| 21 | ne. | 4 | ene. | 2 | ene. | 2 | e. | 4 | ese. | 4 | ese. | 6 | ese. | 4 | se. | 4 | se. | 2 | sse. | 4 |
| 22 | ne. | 2 | ne. | 4 | nne. | 7 | nne. | 6 | ne. | 6 | | | | | | | | | | |
| 23 | ene. | 3 | ene. | 3 | ne. | 6 | ene. | 5 | ne. | 10 | e. | 3 | se. | 1 | sse. | 2 | sw. | 6 | sw. | 10 |
| 24 | ene. | 5 | ne. | 18 | nne. | 20 | ne. | 18 | ne. | 19 | | | | | | | | | | |
| 25 | e. | 3 | ne. | 3 | sw. | 4 | wsw. | 2 | sw. | 2 | sse. | 3 | ese. | 3 | se. | 3 | sse. | 6 | sse. | 6 |
| 26 | ne. | 7 | ne. | 14 | ne. | 8 | nne. | 14 | ne. | 8 | ne. | 8 | ne. | 7 | ene. | 6 | ene. | 9 | | |
| 27 | e. | 3 | ne. | 12 | ne. | 9 | ene. | 3 | e. | 3 | e. | 6 | e. | 10 | e. | 9 | e. | 9 | e. | 7 |
| 28 | Calm | | s. | 2 | s. | 2 | ene. | 3 | ene. | 5 | ene. | 5 | ene. | 8 | e. | 7 | ene. | 10 | ene. | 10 |
| 29 | Calm | | ssw. | 4 | w. | 2 | ne. | 3 | ene. | 2 | | | | | | | | | | |
| 30 | nne. | 2 | ne. | 8 | ne. | 12 | ne. | 11 | ne. | 8 | ne. | 13 | ne. | 12 | | | | | | |
| 31 | e. | 3 | ne. | 13 | nne. | 15 | nne. | 20 | n. | 17 | nne. | 9 | | | | | | | | |

[1] None. Low clouds. [2] None. Snowing. [12] None. Blowing snow.

TABLE 1.—*Wind direction (to 16 compass points) and velocity (in meters per second) for the surface and standard metric levels above sea level*—Continued

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| Date | Surface | | 500 m. | | 1,000 m. | | 1,500 m. | | 2,000 m. | | 3,000 m. | | 4,000 m. | | 5,000 m. | | 6,000 m. | | 7,000 m. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. |
| 1 | ne. | 4 | ne. | 9 | sse. | 2 | s. | 3 | sse. | 4 | sse. | 7 | se. | 10 | | | | | | |
| 2 [9] | | | | | | | | | | | | | | | | | | | | |
| 3 | s. | 1 | ssw. | 6 | sw. | 9 | | | | | | | | | | | | | | |
| 4 [1] | | | | | | | | | | | | | | | | | | | | |
| 5 [1] | | | | | | | | | | | | | | | | | | | | |
| 6 | wsw. | 1 | ssw. | 2 | s. | 2 | | | | | | | | | | | | | | |
| 7 | Calm. | | sw. | 1 | ssw. | 4 | w. | 2 | wnw. | 4 | wnw. | 9 | wnw. | 13 | | | | | | |
| 8 | ene. | 2 | ene. | 7 | nne. | 9 | n. | 9 | nnw. | 7 | nw. | 14 | wnw. | 20 | | | | | | |
| 9 | ene. | 4 | ne. | 14 | ne. | 18 | nne. | 16 | | | | | | | | | | | | |
| 10 | ese. | 4 | ne. | 18 | ne. | 18 | ne. | 11 | ne. | 6 | ne. | 13 | ne. | 9 | ne. | 15 | nne. | 14 | | |
| 11 | ene. | 5 | ese. | 1 | sse. | 4 | s. | 1 | sse. | 1 | sse. | 4 | se. | 7 | se. | 9 | se. | 11 | se. | 8 |
| 12 | Calm. | | ssw. | 3 | | | | | | | | | | | | | | | | |
| 13 | Calm. | | s. | 1 | s. | 3 | se. | 2 | ese. | 2 | ese. | 1 | ssw. | 2 | ssw. | 1 | wnw. | 2 | nnw. | 4 |
| 14 | sw. | 1 | s. | 5 | s. | 12 | sw. | 2 | wsw. | 2 | nw. | 2 | nnw. | 6 | nnw. | 10 | nnw. | 13 | | |
| 15 | sw. | 1 | ese. | 1 | ssw. | 7 | sw. | 5 | ssw. | 2 | nne. | 2 | n. | 6 | nnw. | 8 | nnw. | 10 | nnw. | 10 |
| 16 | Calm. | | ssw. | 5 | ssw. | 10 | ssw. | 12 | ssw. | 7 | sw. | 4 | wsw. | 2 | nw. | 5 | wnw. | 9 | wnw. | 9 |
| 17 | wsw. | 1 | ssw. | 2 | s. | 9 | s. | 8 | | | | | | | | | | | | |
| 18 | ne. | 4 | ene. | 8 | ne. | 5 | ne. | 12 | nne. | 4 | nnw. | 2 | w. | 3 | w. | 6 | wsw. | 9 | wsw. | 11 |
| 19 | ne. | 5 | ne. | 15 | ne. | 11 | ne. | 5 | nnw. | 1 | nw. | 2 | w. | 4 | wsw. | 6 | wsw. | 9 | wsw. | 13 |
| 20 | ene. | 4 | ne. | 13 | ne. | 13 | ne. | 4 | ene. | 7 | | | | | | | | | | |
| 21 | ne. | 4 | ne. | 5 | ne. | 1 | | | | | | | | | | | | | | |
| 22 | ese. | 1 | nne. | 6 | nne. | 8 | nne. | 8 | ne. | 9 | ne. | 4 | ese. | 2 | se. | 2 | ese. | 3 | e. | 5 |
| 23 | ene. | 6 | ne. | 11 | nne. | 10 | ne. | 12 | ene. | 2 | ne. | 4 | ne. | 3 | wnw. | 1 | wsw. | 1 | ssw. | 2 |
| 24 | ese. | 3 | ne. | 17 | ne. | 11 | ene. | 8 | ene. | 7 | ene. | 11 | e. | 5 | | | | | | |
| 25 | nne. | 1 | nw. | 1 | sw. | 5 | wsw. | 3 | sw. | 3 | sse. | 2 | sse. | 2 | ese. | 2 | ese. | 2 | ssw. | 4 |
| 26 | ene. | 5 | ne. | 17 | nne. | 13 | ne. | 13 | ne. | 7 | | | | | | | | | | |
| 27 | ne. | 2 | ese. | 1 | ssw. | 5 | ne. | 1 | ene. | 5 | ene. | 7 | ene. | 9 | e. | 11 | e. | 13 | e. | 16 |
| 28 | Calm. | | ene. | 3 | e. | 3 | ene. | 4 | ene. | 3 | e. | 5 | ene. | 2 | | | | | | |
| 29 | Calm. | | ene. | 1 | nnw. | 1 | ne. | 6 | ene. | 8 | ene. | 11 | ene. | 14 | | | | | | |
| 30 | ene. | 3 | ne. | 13 | ne. | 9 | nne. | 7 | ne. | 8 | nne. | 8 | nne. | 12 | n. | 4 | | | | |
| 31 | ene. | 5 | ne. | 13 | nne. | 19 | nne. | 22 | ne. | 22 | e. | 9 | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ne. | 5 | ne. | 11 | ne. | 5 | ene. | 1 | se. | 3 | | | | | | | | | | |
| 2 | e. | 5 | ne. | 11 | ene. | 3 | ene. | 5 | e. | 2 | ese. | 5 | se. | 15 | | | | | | |
| 3 | e. | 1 | se. | 1 | s. | 7 | ssw. | 2 | s. | 2 | sse. | 7 | ese. | 10 | ese. | 12 | ese. | 15 | ese. | 17 |
| 4 [1] | | | | | | | | | | | | | | | | | | | | |
| 5 [2] | | | | | | | | | | | | | | | | | | | | |
| 6 | sw. | 3 | ssw. | 8 | ssw. | 12 | | | | | | | | | | | | | | |
| 7 | sw. | 2 | ssw. | 6 | ssw. | 6 | sw. | 3 | wsw. | 3 | | | | | | | | | | |
| 8 | s. | 3 | s. | 6 | | | | | | | | | | | | | | | | |
| 9 | wsw. | 3 | ssw. | 5 | s. | 7 | sw. | 7 | | | | | | | | | | | | |
| 10 | ne. | 4 | ene. | 7 | e. | 7 | e. | 2 | se. | 1 | sse. | 4 | sse. | 4 | ssw. | 5 | ssw. | 5 | sw. | 9 |
| 11 | ne. | 4 | e. | 8 | sw. | 2 | sse. | 1 | se. | 5 | | | | | | | | | | |
| 12 | wsw. | 1 | sw. | 4 | | | | | | | | | | | | | | | | |
| 13 | nne. | 1 | ene. | 2 | ese. | 2 | s. | 2 | sse. | 5 | ese. | 7 | ese. | 6 | ese. | 5 | e. | 7 | e. | 5 |
| 14 | e. | 4 | ne. | 12 | ne. | 14 | ne. | 8 | e. | 7 | se. | 4 | sse. | 7 | sse. | 13 | sse. | 12 | | |
| 15 [2] | | | | | | | | | | | | | | | | | | | | |
| 16 | Calm. | | ene. | 8 | ne. | 10 | nne. | 8 | nne. | 8 | nne. | 7 | n. | 2 | se. | 1 | se. | 1 | se. | 2 |
| 17 | wsw. | 2 | ssw. | 7 | sse. | 4 | e. | 4 | nnw. | 3 | nw. | 4 | wsw. | 2 | ssw. | 7 | | | | |
| 18 | Calm. | | ene. | 3 | ene. | 5 | ene. | 4 | ene. | 5 | se. | 2 | | | | | | | | |
| 19 [1] | | | | | | | | | | | | | | | | | | | | |
| 20 [10] | | | | | | | | | | | | | | | | | | | | |
| 21 | Calm. | | nw. | 1 | ssw. | 5 | s. | 8 | s. | 6 | | | | | | | | | | |
| 22 | Calm. | | n. | 1 | e. | 2 | | | | | | | | | | | | | | |
| 23 | ese. | 2 | ne. | 9 | ne. | 11 | nne. | 11 | nne. | 10 | w. | 7 | w. | 11 | w. | 11 | w. | 13 | | |
| 24 | wnw. | 3 | ne. | 11 | nne. | 10 | n. | 13 | n. | 13 | nnw. | 14 | | | | | | | | |
| 25 | ese. | 3 | ne. | 6 | nne. | 7 | | | | | | | | | | | | | | |
| 26 | e. | 6 | ne. | 11 | ne. | 17 | ne. | 13 | ne. | 18 | ne. | 6 | ene. | 1 | ene. | 2 | s. | 1 | s. | 2 |
| 27 | ese. | 3 | ne. | 11 | ene. | 9 | n. | 1 | ssw. | 2 | wsw. | 2 | w. | 3 | w. | 3 | wsw. | 7 | sw. | 7 |
| 28 | ese. | 2 | ne. | 8 | ne. | 7 | ne. | 6 | n. | 6 | n. | 4 | nnw. | 3 | | | | | | |
| 29 | e. | 2 | ene. | 8 | ene. | 8 | ne. | 2 | n. | 4 | nnw. | 6 | nnw. | 3 | n. | 8 | n. | 6 | | |
| 30 | sw. | 1 | ssw. | 7 | sw. | 6 | s. | 2 | sse. | 1 | sse. | 1 | ese. | 2 | ese. | 4 | ese. | 7 | ene. | 5 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ne. | 4 | ene. | 7 | e. | 4 | se. | 2 | ese. | 4 | sse. | 7 | se. | 5 | se. | 8 | se. | 7 | | |
| 2 | ne. | 5 | ne. | 12 | ne. | 3 | ne. | 1 | ese. | 2 | ese. | 7 | se. | 13 | sse. | 20 | sse. | 22 | | |
| 3 | sw. | 2 | ssw. | 9 | | | | | | | | | | | | | | | | |
| 4 [2] | | | | | | | | | | | | | | | | | | | | |
| 5 [1] | | | | | | | | | | | | | | | | | | | | |
| 6 | wsw. | 3 | ssw. | 4 | ssw. | 7 | wnw. | 2 | nw. | 2 | wsw. | 2 | nnw. | 4 | n. | 4 | nnw. | 4 | nnw. | 7 |
| 7 | ssw. | 3 | ssw. | 9 | ssw. | 10 | | | | | | | | | | | | | | |
| 8 | ssw. | 4 | s. | 6 | | | | | | | | | | | | | | | | |
| 9 | sw. | 1 | ne. | 5 | ne. | 2 | se. | 3 | s. | 3 | sw. | 4 | sw. | 7 | sw. | 8 | sw. | 9 | sw. | 9 |
| 10 | ene. | 4 | ene. | 3 | se. | 1 | se. | 4 | ese. | 3 | ese. | 8 | ese. | 8 | se. | 7 | | | | |
| 11 | nne. | 2 | e. | 1 | w. | 1 | ssw. | 3 | sse. | 5 | s. | 5 | s. | 6 | se. | 5 | ese. | 5 | ese. | 9 |
| 12 | sw. | 1 | sse. | 1 | sse. | 5 | sse. | 8 | | | | | | | | | | | | |
| 13 | wsw. | 2 | ssw. | 5 | ssw. | 5 | se. | 8 | se. | 7 | | | | | | | | | | |
| 14 | e. | 5 | ne. | 10 | ne. | 16 | ene. | 11 | ne. | 15 | ene. | 11 | ese. | 8 | | | | | | |
| 15 | sw. | 4 | ssw. | 15 | | | | | | | | | | | | | | | | |
| 16 | ene. | 3 | ene. | 9 | ne. | 13 | nne. | 9 | nne. | 7 | n. | 7 | nnw. | 9 | sw. | 3 | sw. | 5 | ssw. | 8 |
| 17 | w. | 2 | ssw. | 6 | s. | 3 | e. | 2 | ene. | 2 | nnw. | 3 | se. | 1 | ssw. | 5 | s. | 7 | s. | 9 |
| 18 | s. | 1 | sw. | 2 | sse. | 2 | sse. | 3 | sse. | 4 | sse. | 6 | | | | | | | | |
| 19 [10] | | | | | | | | | | | | | | | | | | | | |
| 20 | Calm. | | w. | 1 | s. | 3 | s. | 5 | sse. | 7 | se. | 5 | | | | | | | | |
| 21 | Calm. | | nw. | 1 | sse. | 1 | se. | 3 | sse. | 6 | s. | 2 | | | | | | | | |
| 22 | s. | 1 | ene. | 7 | ene. | 5 | ne. | 3 | wnw. | 2 | wsw. | 6 | | | | | | | | |
| 23 | e. | 3 | nne. | 11 | nne. | 16 | nne. | 13 | n. | 12 | n. | 9 | nnw. | 4 | nw. | 9 | wnw. | 9 | wsw. | 11 |
| 24 | ene. | 3 | ene. | 10 | ne. | 11 | nw. | 11 | n. | 13 | wnw. | 9 | wnw. | 8 | | | | | | |
| 25 | e. | 2 | ne. | 11 | ne. | 9 | nne. | 7 | n. | 8 | n. | 7 | | | | | | | | |
| 26 | ene. | 4 | ene. | 15 | ne. | 12 | nne. | 11 | e. | 8 | | | | | | | | | | |
| 27 | e. | 3 | ene. | 7 | ne. | 3 | nw. | 1 | wsw. | 1 | nw. | 2 | wnw. | 4 | wnw. | 6 | nw. | 7 | nw. | 8 |
| 28 | sse. | 1 | ne. | 5 | nne. | 3 | nne. | 7 | n. | 7 | nne. | 9 | n. | 7 | nnw. | 8 | nnw. | 12 | nnw. | 16 |
| 29 | Calm. | | wnw. | 2 | s. | 1 | ese. | 2 | wnw. | 3 | nw. | 4 | nw. | 4 | n. | 5 | n. | 7 | n. | 8 |
| 30 | e. | 1 | ssw. | 5 | ssw. | 8 | Calm. | | s. | 2 | s. | 2 | sse. | 4 | sse. | 6 | s. | 4 | se. | 2 |

[1] None. Low clouds.

[2] None. Snowing.

[10] None. Foggy.

TABLE 1A.—*Continuation of wind data in preceding table 1 showing wind data for levels of 8,000 meters and above*

[Months or days with no data for these levels are omitted]

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| Date | 8,000 m. | | 9,000 m. | | 10,000 m. | | 11,000 m. | | 12,000 m. | | 13,000 m. | | 14,000 m. | | 15,000 m. | | 16,000 m. | | 17.000 m. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. | Dir. | Vel. |
| 11 | sse. | 13 | sse. | 12 | | | | | | | | | | | | | | | | |
| 18 | n. | 21 | | | | | | | | | | | | | | | | | | |
| 23 | wnw. | 18 | wnw. | 20 | wnw. | 22 | wnw. | 15 | | | | | | | | | | | | |

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| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24[1] | | | | | | | | | | | | | | | | | | | | |
| 25 | n. | 14 | nnw. | 10 | nw. | 11 | | | | | | | | | | | | | | |
| 26 | nnw. | 16 | | | | | | | | | | | | | | | | | | |
| 28 | n. | 5 | n. | 10 | nw. | 10 | nnw. | 11 | nnw. | 8 | | | | | | | | | | |

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| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | e. | 3 | ene. | 6 | | | | | | | | | | | | | | | | |
| 25 | nnw. | 16 | nnw. | 10 | | | | | | | | | | | | | | | | |
| 27 | nnw. | 9 | nnw. | 18 | nnw. | 27 | nnw. | 34 | | | | | | | | | | | | |

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| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | n. | 5 | n. | 11 | | | | | | | | | | | | | | | | |
| 10 | ese. | 9 | e. | 7 | | | | | | | | | | | | | | | | |
| 11 | sse. | 8 | sse. | 10 | sse. | 22 | | | | | | | | | | | | | | |
| 28 | e. | 9 | ene. | 7 | | | | | | | | | | | | | | | | |

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| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | nnw. | 9 | | | | | | | | | | | | | | | | | | |
| 9 | ene. | 20 | | | | | | | | | | | | | | | | | | |
| 14 | e. | 13 | e. | 11 | e. | 11 | | | | | | | | | | | | | | |
| 23 | se. | 9 | | | | | | | | | | | | | | | | | | |
| 27 | ene. | 10 | e. | 10 | e. | 9 | | | | | | | | | | | | | | |
| 28 | se. | 4 | ese. | 5 | | | | | | | | | | | | | | | | |
| 30 | se. | 9 | | | | | | | | | | | | | | | | | | |

MAY 1938—6 A. M.

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | ssw. | 1 | s. | 6 | nw. | 2 | n. | 2 | nne. | 1 | ene. | 4 | ene. | 12 | | | | | | |
| 14 | nnw. | 14 | nnw. | 11 | nnw. | 9 | n. | 7 | | | | | | | | | | | | |
| 16 | nw. | 13 | | | | | | | | | | | | | | | | | | |
| 19 | wsw. | 12 | wsw. | 8 | sw. | 9 | | | | | | | | | | | | | | |
| 20 | s. | 6 | s. | 4 | s. | 2 | | | | | | | | | | | | | | |
| 21 | s. | 1 | | | | | | | | | | | | | | | | | | |
| 23 | sw. | 12 | sw. | 13 | sw. | 7 | ssw. | 5 | ssw. | 4 | sw. | 4 | ssw. | 8 | sw. | 10 | sw. | 10 | sw. | 15 |
| 25 | sw. | 7 | ssw. | 13 | s. | 4 | e. | 2 | | | | | | | | | | | | |
| 27 | ene. | 6 | ene. | 10 | ene. | 7 | | | | | | | | | | | | | | |
| 28 | ene. | 11 | ene. | 11 | | | | | | | | | | | | | | | | |

MAY 1938—6 P. M.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | n. | 7 | n. | 5 | nnw. | 5 | nnw. | 6 | n. | 5 | | | | | | | | | | |
| 15 | nw. | 13 | nw. | 14 | | | | | | | | | | | | | | | | |
| 18 | wsw. | 13 | wsw. | 8 | | | | | | | | | | | | | | | | |
| 19 | sw. | 14 | sw. | 8 | ssw. | 6 | | | | | | | | | | | | | | |
| 22 | se. | 4 | s. | 6 | | | | | | | | | | | | | | | | |
| 23 | s. | 6 | s. | 3 | ese. | 5 | | | | | | | | | | | | | | |
| 25 | sw. | 5 | wsw. | 6 | s. | 2 | | | | | | | | | | | | | | |

JUNE 1938—6 A. M.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | se. | 18 | | | | | | | | | | | | | | | | | | |
| 10 | sw. | 12 | sw. | 12 | | | | | | | | | | | | | | | | |
| 13 | ene. | 8 | ene. | 7 | | | | | | | | | | | | | | | | |
| 16 | ese. | 5 | ese. | 6 | | | | | | | | | | | | | | | | |
| 26 | sse. | 3 | se. | 4 | ese. | 2 | | | | | | | | | | | | | | |
| 27 | sw. | 10 | sw. | 9 | wsw. | 5 | w. | 3 | wnw. | 3 | | | | | | | | | | |
| 30 | ene. | 7 | e. | 11 | e. | 18 | ene. | 6 | | | | | | | | | | | | |

JUNE 1938—6 P. M.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | n. | 8 | | | | | | | | | | | | | | | | | | |
| 9 | ssw. | 10 | sw. | 9 | | | | | | | | | | | | | | | | |
| 11 | ese. | 12 | | | | | | | | | | | | | | | | | | |
| 16 | s. | 11 | ssw. | 15 | | | | | | | | | | | | | | | | |
| 17 | s. | 10 | sse. | 11 | s. | 6 | | | | | | | | | | | | | | |
| 23 | wsw. | 18 | wsw. | 22 | | | | | | | | | | | | | | | | |
| 27 | nw. | 8 | nw. | 6 | wnw. | 5 | wnw. | 2 | | | | | | | | | | | | |
| 28 | n. | 18 | | | | | | | | | | | | | | | | | | |
| 29 | nnw. | 11 | n. | 10 | n. | 13 | n. | 9 | | | | | | | | | | | | |
| 30 | e. | 4 | se. | 10 | se. | 12 | ese. | 8 | | | | | | | | | | | | |

[1] None. Low clouds.

TABLE 2.—*Average height of clouds as determined by pilot-balloon observations, September 1937 to June 1938, inclusive*

| Cloud Type | Spring | | Summer[1] | | Autumn | | Winter | | Annual | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average height | Number observations | Average height | Number observations | Average height | Number observations | Average height | Number observations | Average height | Number observations |
| Cl | ------ | ------ | 5,677 | 1 | 5,227 | 2 | ------ | ------ | 5,377 | 3 |
| Cs | 4,095 | 9 | 5,317 | 2 | 3,877 | 1 | ------ | ------ | 4,282 | 12 |
| As | 2,435 | 4 | 3,187 | 6 | 3,157 | 2 | 2,257 | 4 | 2,763 | 16 |
| Ac | 2,437 | 1 | ------ | ------ | 2,317 | 3 | ------ | ------ | 2,347 | 4 |
| Sc | 1,311 | 13 | 1,165 | 9 | 1,065 | 5 | 1,054 | 3 | 1,201 | 30 |
| St | 1,115 | 9 | 804 | 2 | 1,378 | 4 | 1,033 | 11 | 1,097 | 26 |

[1] Month of June 1938, only.

# TROPICAL DISTURBANCES OF OCTOBER 1939

By WILLIS E. HURD

[Weather Bureau, Washington, November 1939]

*Hurricane of October 12–18, 1939.*—The fourth tropical disturbance of 1939, that of October 12–18, unlike its predecessors of June, August, and September, which were of light to moderate character, was a hurricane of fully developed intensity. It originated to the eastward of the Antilles, and its preliminary signs were evidenced by unsettled weather and somewhat depressed barometer, with light winds, over the Leeward Islands during the afternoon of the 9th. From the 9th to the 12th there was but little change in the situation, except for a slight fall in barometer over the Leewards. By the morning of the 13th, cyclonic circulation appeared to be developing northeast of Puerto Rico, with winds of force 5–6 reported by ships south and west of the center which, at 7 a. m. (E. S. T.) was in approximately 21° N., 66° W. The lowest known barometer at the time was 1,005 millibars (29.68 inches), wind west, force 5, reported by a ship near 19° N., 65° W. Thereafter development of the disturbance was much more rapid, and it moved, first in a north-northwesterly direction, then north-northeast past Bermuda on the 16th, until its identity was lost on the 18th east of northern Newfoundland.

By 7 a. m. (E. S. T.) of the 14th, although there were no ships' observations to the near eastward of the center, winds in other quadrants of the disturbance denoted the establishment of a cyclonic circulation. The American steamer *Argentina*, near 25° N., 68° W., at that time, gave a barometer of 1,001 millibars (29.56 inches), wind east-northeast, force 6. At local noon of the 14th the Panaman motorship *Permian*, in 22°43′ N., 69°33′ W., reported the earliest known gale, a northwest wind of force 7, barometer 1,001.7 millibars (29.58 inches), observed in connection with the cyclone. Squally weather continued over a wide area throughout the day, with highest winds reported as of force 7, lowest barometers about 999 millibars (29.50 inches).

During the night of the 14th–15th, or very early on the 15th, rapid intensification set in. A report received by mail from the American steamship *F. W. Abrams* shows that at 1:50 a. m., local time of the 15th, the barometer on ship had fallen to 988.5 millibars (29.19 inches) in 26°54′ N., 66°18′ W., with wind east, force 8. At 7:50 a. m., local time, in 26°36′ N., 66°48′ W., the wind was a hurricane from the east, with barometer down to 941.4 millibars (27.80 inches), the lowest pressure observed during the course of the storm. The center at 7 a. m. (E. S. T.) of that date was close to 27° N., 67° W. High winds covered a wide extent of the sea during the local forenoon hours of the 15th. At 2 a. m. the southbound American steamship *Borinquen* in 28°00′ N., 65°30′ W., had a barometer of 969.5 millibars (28.63 inches), with northwest winds, force 10. Between about 10 a. m. and 2 p. m. the ship encountered southwesterly gales of hurricane force, with rising barometer. Considerably to the northwestward, the Dutch steamship *Telamon*, near 29° N., 69° W., had a northeasterly gale of force 10 during the midday hours, and at local noon the American steamship *Ponce* had a force-8 gale in 32°30′ N., 71°45′ W. During the afternoon the Dutch southbound steamship *Bacchus* experienced gales of force 10 to 12 from north to northeast, lowest barometer 993.9 millibars (29.35 inches) at 5 p. m. near 30° N., 68° W. In the same position, during the early morning hours of the 16th until about 6 a. m., the winds at the ship continued at force 11 from north-northeast. The cyclone center at that time was a short distance south of Bermuda.

From early morning on the 14th, the hurricane, which until then had been pursuing a generally north-northwesterly course, began curving into a north-northeasterly direction, under the influence of a strong anticyclone that was pressing seaward with crest over the Middle Atlantic States. It was during this recurve that the storm rapidly entered its hurricane stage.

For the 16th ship reports are lacking from near the center of the hurricane and, except for the force-11 gale experienced in the early morning by the *Bacchus*, no other vessel reported a wind higher than force 9. This was in 36°22′ N., 66°55′ W., lowest barometer 1,003 millibars (29.62 inches), read on the Dutch steamer *Hermes*. At greater distances north and west of the storm center, there were moderate to fresh gales.

Press reports from Bermuda show the islands to have been swept by hurricane winds for several hours during the afternoon of the 16th, with a maximum velocity of 131 miles an hour from the north at 6:40 p. m., as the center of the hurricane passed close to the eastward. Here considerable damage was done to trees, boats, houses, and public utilities.

During the greater part of the 17th the hurricane continued on a north-northeasterly course, with the center

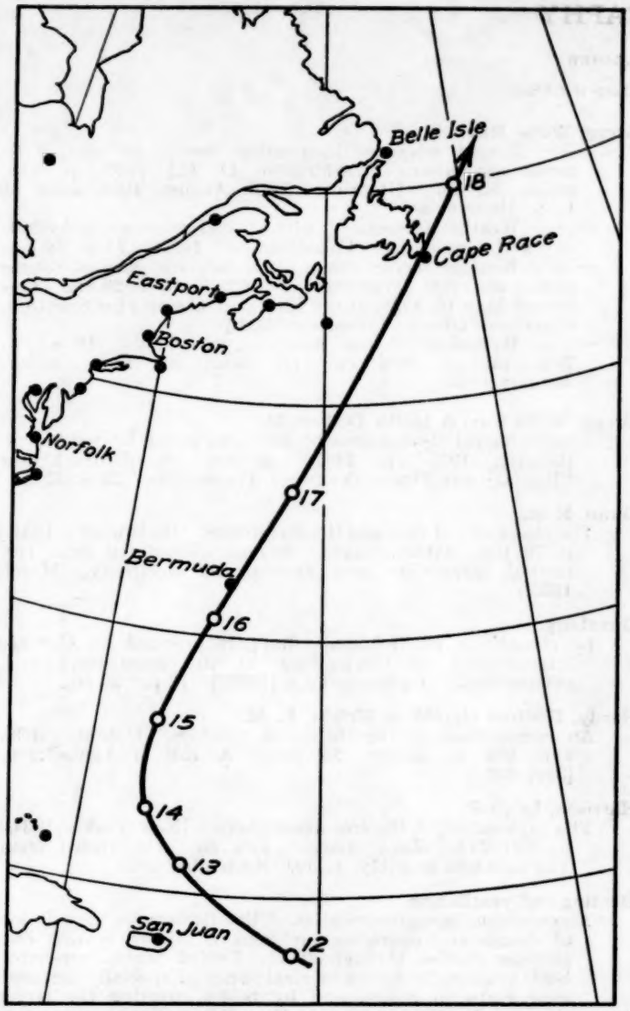


FIGURE 1.—Approximate track of the North Atlantic hurricane of October 12–18, 1939. The circles show closely the positions of the storm center at 7 a. m. (E. S. T.) on the dates given.

at 7 a. m. (E. S. T.) at approximately 36° to 37° N., 61° W. Several ships were heavily involved. The Dutch steamship *Palembang* in 35°24′ N., 58°21′ W., had lowest barometer 991.6 millibars (29.28 inches), with a south-southeast gale of force 10. About 6 hours later the wind at ship had changed to southwest, force 11. Early in the afternoon on a westerly course, she had passed to the southward of the storm center. The Dutch steamship *Ulysses*, somewhat closer to the center, had a south-southwest wind of force 11, barometer 966.8 millibars (28.55 inches), at 6 a. m., local time, in 36°37′ N., 60°02′ W. At 10 a. m., the wind had arisen to force 12 from the west, with rising pressure. A report from the Belgian steamship *Indier* noted dense fog from 9 a. m. until 3 p. m. This vessel had lowest barometer 986.8 millibars (29.14 inches), with hurricane wind from the north, at local noon of the 17th, in 41°34′ N., 61°12, W.

To the eastward of the *Indier*, on the 17th, the American steamship *Acadia* was very close to the storm center at 4 p. m., with lowest barometer 961.7 millibars (28.40 inches), wind northwest, force 12, near 42° N., 59° W. For several hours thereafter this westbound vessel, hove to, continued in the grip of full hurricane winds.

At 7 p. m. (E. S. T.) of the 17th the hurricane center was very close to 44° N., 56° W., as indicated by the report from an unnamed ship near 42° N., 56½° W., with a barometer of 954 millibars (28.17 inches), and a hurricane wind from south-southwest. Storm to hurricane winds were met by several ships within the region 40°–45° N. 50°–60° W.

Late on the night of the 17th the American liner *President Harding*, westbound for New York, encountered such heavy weather about 300 miles south of St. Johns, Newfoundland, according to press reports, that one of her crew was drowned and 73 of her passengers and crew received serious to minor injuries, necessitating an emergency call for medical supplies. These supplies were received from the Coast Guard Cutter *Hamilton* during the 18th. Some damage was done to the ship, as well as to other vessels, due to heavy winds and seas.

During the night of the 17th–18th the center continued in a north-northeasterly direction. In the early morning of the 18th it lay east of Newfoundland, still of great intensity, as shown by the report of the steamship *American Shipper*. At 4 a. m., local time, this vessel, in 47°55′ N., 50°59′ W., had a low barometer of 953.3 millibars (28.15 inches), with a south wind of force 11, changing, 2 hours later, to a southwest wind of force 12. The Belgian steamship *Kasongo*, at 2 a. m., had a hurricane wind from the south much farther to the eastward, in 45°35′ N., 47°30′ W., but with much higher barometer.

The storm center at 7 a. m. (E. S. T.) of the 18th was located close to 50° N., 50° W. There is no certainty as to its later movements or intensity owing to lack of reports, due to the war situation.

Figure 1 shows the approximate track of the storm, which may be subject to revision if later information warrants.

From the beginning of the disturbance as an area of unsettled weather late on the 9th in the Leeward Islands until early on the 13th when the LOW center lay northeast of Puerto Rico, advisories were issued frequently from the forecast center at San Juan, P. R. Thereafter until the 16th, advisories were continued from the forecast center at Jacksonville, Fla., and on the 17th, from Washington, D. C.

*Disturbance of October 27–November 6.*—Late in October disturbed conditions developed in the southwestern Caribbean Sea. The disturbance moved northward to the vicinity of Swan Island on the 29th. On the 30th it took an east-northeasterly direction, crossing Grand Cayman Island, where hurricane intensity was developed on the 31st, then passed between Jamaica and Cuba during November 1–3. Considerable damage was done in Jamaica due to wind and heavy rains. A complete account of the cyclone will be reserved for the November issue of the REVIEW, pending further receipts of ships' reports.

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# SOLAR OBSERVATIONS

[Meteorological Research Division, EDGAR W. WOOLARD in charge]

## SOLAR RADIATION OBSERVATIONS, OCTOBER 1939

By CHARLES M. LENNAHAN

Measurements of solar radiant energy received at the surface of the earth are made at nine stations maintained by the Weather Bureau, and at ten cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data, obtained up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Madison and Lincoln the observations are made with the Marvin pyrheliometer; at Washington and Blue Hill they are obtained with a recording thermopile, checked by observations with a Marvin pyrheliometer at Washington and with a Smithsonian silver disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, then departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Direct radiation intensities averaged below normal at Washington, Lincoln, Madison, and Blue Hill.

Total solar and sky radiation was above normal at all stations except Friday Harbor and Newport. Data for five of the regular reporting stations are not included because for various reasons the data were not available. These data will be published as soon as they are available.

Polarization observations made at Madison, Wis., during the past 4 months are summarized as follows:

Seven observations in July averaged 57.8 with a maximum of 62 on the 31st, both of which were below normal. Eight observations in August averaged 61.0, which was above normal; the maximum of 68 on the 24th was just normal. Six observations in September averaged 59.2 with a maximum of 69 on the 5th, both of which were below normal. Four observations in October averaged 68.5, which was above normal; the maximum of 70 on the 23rd was normal.

TABLE 1.—*Solar radiation intensities during October 1939*

[Gram-calories per minute per square centimeter of normal surface]

**WASHINGTON, D. C.**

| Date | Sun's zenith distance: 7:30 a. m. | 78.7° | 75.7° | 70.7° | 60.0° | 0.0° | 60.0° | 70.7° | 75.7° | 78.7° | 1:30 p. m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 75th mer. time | Air mass: A. M. | | | | | P. M. | | | | 75th mer. time |
| | e | 5.0 | 4.0 | 3.0 | 2.0 | *1.0 | 2.0 | 3.0 | 4.0 | 5.0 | e. |
| 1939 | mm. | cal. | cal. | cal. | cal. | cal. | cal. | cal. | cal. | cal. | mm. |
| Oct. 7 | 9.83 | | | 1.00 | 1.12 | | | | | | 10.21 |
| Oct. 9 | 13.61 | | | | 1.00 | | | | | | 15.65 |
| Oct. 10 | 14.10 | | | | 1.00 | | | | | | 11.81 |
| Oct. 15 | 4.75 | | | | 1.28 | | | | | | 3.00 |
| Oct. 18 | 3.15 | | | 1.14 | 1.29 | | | | | | 2.87 |
| Oct. 19 | 6.50 | | | .72 | .91 | | 0.88 | | | | 8.81 |
| Oct. 20 | 9.14 | | | .69 | .90 | | | | | | 10.21 |
| Means | | | | .89 | 1.07 | | .88 | | | | |
| Departures | | | | −.07 | −.06 | | −.24 | | | | |

**LINCOLN, NEBR.**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. 2 | 4.37 | | | | | | 1.14 | | | | 6.50 |
| Oct. 3 | 4.95 | 0.64 | 0.75 | 0.87 | 1.02 | | 0.78 | 0.43 | 0.29 | | 7.04 |
| Oct. 5 | 6.50 | .90 | 1.02 | 1.16 | 1.31 | 1.49 | 1.26 | 1.02 | .81 | 0.64 | 8.18 |
| Oct. 6 | 6.50 | .85 | .94 | 1.04 | 1.12 | 1.33 | 1.22 | 1.01 | .86 | .74 | 5.36 |
| Oct. 10 | 4.95 | 1.03 | 1.13 | 1.26 | 1.43 | 1.58 | 1.40 | 1.21 | 1.07 | .95 | 6.27 |
| Oct. 11 | 5.56 | .92 | 1.04 | 1.19 | | | | | | | 5.16 |
| Oct. 12 | 4.57 | | | | 1.25 | | | | | | 4.17 |
| Oct. 14 | 3.00 | .81 | 1.02 | 1.20 | 1.35 | | | | | | 4.37 |
| Oct. 16 | 3.30 | | | | 1.05 | | | | | | 3.63 |
| Oct. 17 | 2.87 | .78 | .86 | | 1.23 | | | | | | 3.81 |
| Oct. 18 | 5.56 | .77 | .90 | 1.06 | 1.25 | | .96 | .48 | .33 | | 7.04 |
| Oct. 19 | 4.75 | .82 | .94 | 1.11 | 1.27 | | 1.30 | 1.14 | .98 | .86 | 6.50 |
| Oct. 20 | 6.76 | | | | | | 1.25 | | | | 6.02 |
| Oct. 23 | 5.16 | .82 | .94 | 1.10 | 1.27 | | 1.33 | 1.12 | .92 | .73 | 6.50 |
| Oct. 25 | 6.27 | .61 | .71 | .85 | 1.10 | | 1.10 | .87 | .71 | .58 | 9.14 |
| Oct. 28 | 2.62 | .89 | 1.04 | 1.13 | 1.40 | | | | | | 4.37 |
| Oct. 30 | 3.00 | | | | | | 1.46 | 1.32 | 1.18 | 1.05 | 2.62 |
| Oct. 31 | 2.36 | | | | 1.45 | | | 1.27 | 1.12 | 1.00 | 4.17 |
| Means | | .82 | .94 | 1.09 | 1.25 | 1.47 | 1.20 | .99 | .83 | .82 | |
| Departures | | −.01 | +.01 | 0.00 | −.03 | −.01 | −.05 | −.08 | −.11 | −.01 | |

TABLE 1.—*Solar radiation intensities during October 1939*—Continued

**MADISON, WIS.**

| Date | Sun's zenith distance: 7:30 a. m. | 78.7° | 75.7° | 70.7° | 60.0° | 0.0° | 60.0° | 70.7° | 75.7° | 78.7° | 1:30 p. m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 75th mer. time | Air mass: A. M. | | | | | P. M. | | | | 75th mer. time |
| | e | 5.0 | 4.0 | 3.0 | 2.0 | *1.0 | 2.0 | 3.0 | 4.0 | 5.0 | e. |
| 1939 | mm. | cal. | cal. | cal. | cal. | cal. | cal. | cal. | cal. | cal. | mm. |
| Oct. 2 | 5.16 | | | .76 | 1.19 | 1.45 | 1.14 | | | | 4.75 |
| Oct. 4 | 7.04 | | 0.40 | .66 | | | | | | | 8.81 |
| Oct. 5 | 11.38 | | | .47 | 1.16 | 1.48 | 1.19 | | | | 7.57 |
| Oct. 6 | 7.57 | | | .95 | 1.28 | 1.46 | 1.25 | 0.92 | | | 7.57 |
| Oct. 11 | 5.79 | | | | 1.22 | 1.50 | 1.19 | | | | 4.57 |
| Oct. 12 | 4.57 | | 1.01 | | | | | | | | 3.63 |
| Oct. 17 | 3.15 | | | | | | 1.25 | | | | 3.15 |
| Oct. 20 | 5.56 | | | | 1.14 | | | | | | 5.16 |
| Oct. 23 | 5.56 | | | | | | 1.31 | | | | 5.56 |
| Means | | | | .70 | .71 | 1.20 | 1.47 | 1.22 | .92 | | |
| Departures | | | | −.22 | −.33 | 0.00 | +.03 | +.02 | −.10 | | |

**BLUE HILL, MASS.**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. 5 | 9.6 | 0.83 | | | 1.24 | | 1.01 | | | | 11.1 |
| Oct. 7 | 9.6 | | 0.72 | 0.88 | 1.20 | 1.21 | | | | | 8.2 |
| Oct. 8 | 8.2 | .82 | .95 | 1.13 | | | | | | | 8.8 |
| Oct. 10 | 11.1 | | .38 | .55 | .83 | | | | 0.55 | 0.40 | 14.3 |
| Oct. 11 | 10.7 | | | | | 1.25 | | 0.90 | .74 | .64 | 7.9 |
| Oct. 13 | 5.6 | .77 | .90 | 1.02 | 1.16 | 1.30 | 1.10 | .93 | .80 | .71 | 5.2 |
| Oct. 14 | 7.9 | | | | | | | | .95 | .84 | 7.9 |
| Oct. 15 | 2.6 | .94 | 1.04 | 1.16 | 1.30 | 1.38 | 1.32 | 1.16 | 1.05 | .94 | 2.8 |
| Oct. 16 | 2.6 | .96 | 1.06 | 1.17 | 1.28 | 1.32 | 1.25 | 1.08 | .95 | .82 | 3.6 |
| Oct. 17 | 4.6 | .38 | .49 | .60 | .80 | | | | | | 5.6 |
| Oct. 18 | 1.8 | .93 | 1.02 | 1.14 | 1.27 | | 1.27 | 1.10 | .98 | .90 | 1.7 |
| Oct. 19 | 5.6 | | | | | 1.01 | .92 | .77 | .64 | .48 | 6.3 |
| Oct. 21 | 8.2 | .27 | .36 | .48 | | | | | | | 9.9 |
| Oct. 23 | 4.6 | .93 | 1.03 | 1.11 | | | | | | | 3.3 |
| Oct. 24 | 1.8 | .94 | 1.04 | 1.13 | 1.29 | 1.36 | 1.30 | 1.13 | 1.00 | .92 | 1.9 |
| Oct. 28 | 14.3 | | | | | | | | .96 | .89 | 11.1 |
| Oct. 29 | 2.4 | 1.01 | 1.10 | 1.21 | 1.35 | 1.37 | 1.32 | 1.17 | 1.06 | .95 | 3.6 |
| Oct. 30 | 4.0 | .92 | 1.00 | 1.11 | | | | | | | 5.4 |
| Means | | .81 | .85 | .98 | 1.17 | 1.28 | 1.19 | 1.03 | .88 | .77 | |
| Departures | | −.09 | −.11 | −.11 | −.06 | −.08 | −.01 | +.01 | −.03 | .00 | |

*Extrapolated.

TABLE 2.—*Average daily totals of solar rediation (direct+diffuse) received on a horizontal surface*

| Week beginning— | Gram-calories per square centimeter: Washington | Madison | Lincoln | Chicago | New York | Fresno | Cambridge | Fairbanks | La Jolla | Albuquerque | Riverside | San Juan | Friday Harbor | Newport |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | col. | col. | col. | col. | col. | col. | col. | col. | col. | col. | cal. | col. | col. | col. |
| Oct. 1 | 247 | 385 | 380 | 388 | 238 | 361 | 213 | 98 | 419 | 524 | 370 | 590 | 229 | 218 |
| Oct. 8 | 378 | 232 | 312 | 258 | 293 | 453 | 276 | 139 | 457 | 522 | 435 | 573 | 264 | 340 |
| Oct. 15 | 410 | 292 | 354 | 294 | 343 | 393 | 321 | 81 | 407 | 510 | 403 | 548 | 174 | 354 |
| Oct. 22 | 265 | 198 | 305 | 180 | 184 | 392 | 191 | 64 | 373 | 478 | 346 | 393 | 146 | 316 |
| | Departures of daily totals from normals | | | | | | | | | | | | | |
| Oct. 1 | −82 | +106 | +37 | +134 | −46 | −66 | | −17 | +20 | | −9 | +64 | −30 | −85 |
| Oct. 8 | +70 | −14 | +6 | +37 | +25 | +48 | | +47 | +75 | | +59 | +67 | +25 | +31 |
| Oct. 15 | +122 | +70 | +55 | +92 | +116 | +17 | | +10 | +38 | | +50 | +77 | −23 | +65 |
| Oct. 22 | +3 | −9 | +23 | +6 | −8 | +28 | | +3 | +54 | | −11 | −60 | −8 | −31 |
| | Accumulated departures since Jan. 1 | | | | | | | | | | | | | |
| | +17,206 | +11,571 | +7,490 | +18,543 | +6,753 | +441 | | +1,085 | +4,452 | | −4,604 | +9,427 | +5,936 | +2,457 |

## POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.) Superintendent, U. S. Naval Observatory. Data from measurements at the U. S. Naval Observatory from plates obtained at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, below longitude, latitude, area of spot or groups, and spot count, are given respectively the assumed longitude of the center of the disk, assumed latitude of the center of the disk, total area of spots and groups, and total spotless count]

| Date | Eastern standard time | Mount Wilson group No. | Heliographic: Difference in longitude | Heliographic: Longitude | Heliographic: Latitude | Heliographic: Distance from center of disk | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| *1939* | h m | | ° | ° | ° | ° | | | | |
| Oct. 3 | 13 34 | 6629 | −49 | 227 | −17 | 54 | 291 | 4 | G | U. S. Naval. |
| | | 6625 | −18 | 258 | −14 | 27 | 48 | 14 | | |
| | | 6627 | −13 | 263 | +13 | 13 | 24 | 1 | | |
| | | 6628 | −10 | 266 | −13 | 22 | 170 | 8 | | |
| | | 6623 | −6 | 270 | +21 | 16 | 533 | 7 | | |
| | | 6630 | +3 | 279 | −7 | 13 | 73 | 14 | | |
| | | (*) | +10 | 286 | +15 | 13 | 48 | 9 | | |
| | | 6622 | +20 | 296 | +15 | 22 | 194 | 22 | | |
| | | 6622 | +27 | 303 | +14 | 28 | 97 | 6 | | |
| | | 6621 | +37 | 313 | +19 | 37 | 36 | 6 | | |
| | | 6621 | +37 | 313 | +15 | 36 | 436 | 3 | | |
| | | 6620 | +51 | 327 | +17 | 51 | 24 | 1 | | |
| | | 6626 | +57 | 333 | −9 | 59 | 388 | 17 | | |
| | | 6618 | +77 | 353 | −15 | 76 | 970 | 6 | | |
| | | | | (276) | (+7) | | 3,332 | 118 | | |
| Oct. 4 | 11 35 | 6629 | −36 | 228 | −17 | 43 | 242 | 3 | P | Mt. Wilson. |
| | | 6623 | −10 | 254 | +22 | 19 | 24 | 5 | | |
| | | 6627 | −1 | 263 | +13 | 7 | 24 | 3 | | |
| | | 6628 | +3 | 267 | −14 | 21 | 145 | 10 | | |
| | | 6623 | +7 | 271 | +21 | 16 | 533 | 12 | | |
| | | 6630 | +16 | 280 | −8 | 22 | 73 | 11 | | |
| | | 6622 | +32 | 296 | +14 | 32 | 97 | 20 | | |
| | | 6621 | +49 | 313 | +15 | 49 | 339 | 7 | | |
| | | 6620 | +66 | 330 | +16 | 65 | 24 | 1 | | |
| | | 6626 | +70 | 334 | −9 | 71 | 291 | 11 | | |
| | | | | (264) | (+7) | | 1,792 | 83 | | |
| Oct. 5 | 11 22 | 6632 | −71 | 180 | −18 | 76 | 121 | 5 | G | U. S. Naval. |
| | | 6629 | −23 | 228 | −17 | 32 | 339 | 11 | | |
| | | 6631 | −15 | 236 | −12 | 23 | 48 | 12 | | |
| | | 6625 | +16 | 267 | −14 | 25 | 145 | 13 | | |
| | | 6623 | +20 | 271 | +21 | 25 | 485 | 4 | | |
| | | 6630 | +30 | 281 | −8 | 34 | 218 | 16 | | |
| | | 6622 | +47 | 298 | +13 | 48 | 48 | 9 | | |
| | | 6621 | +62 | 313 | +15 | 61 | 485 | 6 | | |
| | | 6626 | +82 | 333 | −9 | 84 | 388 | 4 | | |
| | | | | (251) | (+7) | | 2,277 | 80 | | |
| Oct. 6 | 10 50 | 6633 | −75 | 163 | −7 | 76 | 582 | 25 | VG | Do. |
| | | 6632 | −59 | 179 | −18 | 63 | 109 | 7 | | |
| | | (*) | −20 | 218 | −17 | 30 | 12 | 8 | | |
| | | 6629 | −9 | 229 | −17 | 25 | 315 | 11 | | |
| | | 6631 | −3 | 235 | −12 | 18 | 97 | 11 | | |
| | | 6625 | +25 | 263 | −14 | 32 | 48 | 19 | | |
| | | 6625 | +30 | 268 | −14 | 36 | 97 | 4 | | |
| | | 6623 | +32 | 270 | +20 | 34 | 485 | 10 | | |
| | | 6623 | +34 | 272 | +24 | 38 | 12 | 3 | | |
| | | 6630 | +43 | 281 | −8 | 45 | 97 | 11 | | |
| | | (*) | +48 | 286 | +14 | 48 | 12 | 6 | | |
| | | 6622 | +60 | 298 | +13 | 59 | 48 | 6 | | |
| | | 6621 | +75 | 313 | +14 | 73 | 485 | 5 | | |
| | | | | (238) | (+6) | | 2,399 | 126 | | |
| Oct. 7 | 10 48 | 6635 | −84 | 140 | −21 | 86 | 194 | 1 | VG | Do. |
| | | 6633 | −61 | 163 | −7 | 62 | 436 | 37 | | |
| | | 6632 | −47 | 177 | −17 | 52 | 97 | 12 | | |
| | | 6634 | −7 | 217 | +11 | 9 | 61 | 19 | | |
| | | 6629 | +3 | 227 | −17 | 23 | 291 | 15 | | |
| | | 6631 | +11 | 235 | −12 | 20 | 48 | 12 | | |
| | | 6625 | +35 | 259 | −15 | 41 | 24 | 8 | | |
| | | 6625 | +42 | 266 | −14 | 46 | 97 | 7 | | |
| | | 6623 | +45 | 269 | +21 | 46 | 533 | 9 | | |
| | | 6630 | +57 | 281 | −8 | 58 | 36 | 10 | | |
| | | 6622 | +74 | 298 | +14 | 73 | 24 | 6 | | |
| | | 6621 | +88 | 312 | +14 | 88 | 436 | 1 | | |
| | | | | (224) | (+6) | | 2,277 | 137 | | |
| Oct. 8 | 11 2 | 6635 | −69 | 142 | −21 | 73 | 291 | 5 | G | Mt. Wilson. |
| | | 6633 | −48 | 163 | −7 | 50 | 485 | 55 | | |
| | | 6632 | −35 | 176 | −18 | 41 | 194 | 30 | | |
| | | 6634 | +7 | 218 | +11 | 8 | 48 | 9 | | |
| | | 6629 | +18 | 229 | −17 | 29 | 242 | 3 | | |
| | | 6631 | +26 | 237 | −12 | 31 | 48 | 7 | | |
| | | 6631 | +33 | 244 | −10 | 36 | 48 | 5 | | |
| | | 6625 | +56 | 267 | −14 | 59 | 48 | 4 | | |
| | | 6623 | +57 | 268 | +21 | 56 | 533 | 4 | | |
| | | 6630 | +70 | 281 | −8 | 71 | 48 | 5 | | |
| | | | | (211) | (+6) | | 1,985 | 127 | | |

## POSITIONS AND AREAS OF SUNSPOTS—Continued

| Date | Eastern standard time | Mount Wilson group No. | Heliographic: Difference in longitude | Heliographic: Longitude | Heliographic: Latitude | Heliographic: Distance from center of disk | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| *1939* | h m | | ° | ° | ° | ° | | | | |
| Oct. 9 | 10 56 | 6635 | −56 | 142 | −21 | 62 | 436 | 7 | VG | U. S. Naval. |
| | | 6633 | −35 | 163 | −7 | 37 | 485 | 35 | | |
| | | 6632 | −22 | 176 | −17 | 31 | 242 | 20 | | |
| | | 6629 | +30 | 228 | −17 | 37 | 218 | 1 | | |
| | | 6631 | +39 | 237 | −12 | 43 | 48 | 4 | | |
| | | 6625 | +71 | 269 | −14 | 75 | 97 | 3 | | |
| | | 6623 | +71 | 269 | +20 | 70 | 533 | 3 | | |
| | | | | (198) | (+6) | | 2,059 | 73 | | |
| Oct. 10 | 11 4 | 6635 | −42 | 143 | −21 | 49 | 339 | 5 | VG | Do. |
| | | 6633 | −21 | 164 | −7 | 25 | 388 | 36 | | |
| | | 6632 | −9 | 176 | −17 | 24 | 145 | 22 | | |
| | | (*) | +10 | 195 | −18 | 26 | 6 | 1 | | |
| | | 6629 | +32 | 217 | −16 | 38 | 6 | 1 | | |
| | | 6629 | +42 | 227 | −17 | 47 | 218 | 1 | | |
| | | 6631 | +54 | 239 | −12 | 56 | 48 | 11 | | |
| | | 6623 | +85 | 270 | +20 | 84 | 533 | 1 | | |
| | | | | (185) | (+6) | | 1,683 | 78 | | |
| Oct. 11 | 10 52 | 6635 | −30 | 142 | −21 | 40 | 315 | 20 | VG | Do. |
| | | 6636 | −27 | 145 | + 9 | 26 | 48 | 9 | | |
| | | 6633 | − 7 | 165 | − 7 | 13 | 339 | 53 | | |
| | | 6632 | + 4 | 176 | −17 | 23 | 97 | 21 | | |
| | | 6629 | +46 | 218 | −17 | 51 | 48 | 10 | | |
| | | 6629 | +56 | 228 | −17 | 60 | 218 | 1 | | |
| | | | | (172) | (+6) | | 1,065 | 114 | | |
| Oct. 12 | 11 29 | 6639 | −63 | 95 | + 9 | 61 | 6 | 2 | G | Do. |
| | | 6638 | −26 | 132 | +20 | 28 | 170 | 15 | | |
| | | 6635 | −16 | 142 | −21 | 31 | 291 | 16 | | |
| | | 6636 | −13 | 145 | +10 | 13 | 12 | 5 | | |
| | | 6633 | + 3 | 161 | − 8 | 13 | 73 | 7 | | |
| | | 6633 | +8 | 166 | −6 | 14 | 339 | 40 | | |
| | | 6632 | +18 | 176 | −15 | 27 | 24 | 4 | | |
| | | (*) | +49 | 207 | +16 | 49 | 6 | 4 | | |
| | | 6629 | +60 | 218 | −16 | 64 | 48 | 5 | | |
| | | 6629 | +69 | 227 | −17 | 71 | 218 | 1 | | |
| | | | | (158) | (+6) | | 1,187 | 99 | | |
| Oct. 13 | 10 52 | 6640 | −69 | 76 | +12 | 67 | 6 | 1 | VG | Do. |
| | | 6639 | −50 | 95 | +9 | 50 | 97 | 18 | | |
| | | 6638 | −12 | 133 | +20 | 18 | 194 | 16 | | |
| | | 6635 | −2 | 143 | −21 | 26 | 291 | 24 | | |
| | | 6633 | +16 | 161 | −8 | 21 | 48 | 10 | | |
| | | 6633 | +22 | 167 | −6 | 24 | 727 | 65 | | |
| | | 6632 | +33 | 178 | −15 | 39 | 6 | 2 | | |
| | | 6637 | +38 | 183 | −15 | 44 | 48 | 13 | | |
| | | 6629 | +85 | 230 | −17 | 82 | 242 | 1 | | |
| | | | | (145) | (+6) | | 1,659 | 150 | | |
| Oct. 14 | 10 46 | 6639 | −38 | 94 | +9 | 37 | 48 | 2 | F | Do. |
| | | 6638 | +2 | 134 | +20 | 14 | 218 | 14 | | |
| | | 6635 | +11 | 143 | −21 | 29 | 218 | 17 | | |
| | | 6633 | +36 | 168 | −6 | 38 | 679 | 46 | | |
| | | 6632 | +47 | 179 | −16 | 52 | 6 | 2 | | |
| | | | | (132) | (+6) | | 1,169 | 81 | | |
| Oct. 15 | 10 42 | 6642 | −39 | 80 | +11 | 38 | 97 | 9 | G | Mt. Wilson. |
| | | 6641 | −36 | 83 | −21 | 44 | 97 | 10 | | |
| | | 6639 | −21 | 98 | +8 | 22 | 36 | 11 | | |
| | | 6638 | +14 | 133 | +20 | 20 | 194 | 18 | | |
| | | 6635 | +23 | 142 | −21 | 34 | 170 | 7 | | |
| | | 6633 | +49 | 168 | −7 | 51 | 679 | 45 | | |
| | | 6637 | +68 | 187 | −14 | 70 | 12 | 2 | | |
| | | | | (119) | (+6) | | 1,285 | 102 | | |
| Oct. 16 | 11 8 | 6643 | −31 | 75 | −20 | 40 | 24 | 2 | G | U. S. Naval. |
| | | 6642 | −24 | 82 | +11 | 25 | 388 | 28 | | |
| | | 6641 | −20 | 86 | −21 | 33 | 194 | 26 | | |
| | | 6639 | −10 | 96 | +10 | 12 | 24 | 1 | | |
| | | 6638 | +28 | 134 | +19 | 32 | 170 | 9 | | |
| | | 6635 | +38 | 144 | −20 | 46 | 145 | 4 | | |
| | | 6633 | +63 | 169 | −7 | 63 | 582 | 20 | | |
| | | | | (106) | (+6) | | 1,527 | 90 | | |
| Oct. 17 | 11 14 | 6644 | −88 | 4 | +14 | 88 | 97 | 1 | VG | Do. |
| | | 6642 | −10 | 82 | +11 | 12 | 388 | 34 | | |
| | | 6641 | −5 | 87 | −21 | 27 | 436 | 36 | | |
| | | 6638 | +41 | 133 | +19 | 43 | 218 | 14 | | |
| | | 6635 | +50 | 142 | −20 | 56 | 121 | 9 | | |
| | | 6633 | +79 | 171 | −7 | 80 | 582 | 23 | | |
| | | | | (92) | (+6) | | 1,842 | 117 | | |

## POSITIONS AND AREAS OF SUN SPOTS—Continued

| Date | Eastern standard time | Mount Wilson group No. | Heliographic: Difference in longitude | Heliographic: Longitude | Heliographic: Latitude | Heliographic: Distance from center of disk | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| *1939* | h m | | ° | ° | ° | ° | | | | |
| Oct. 18... | 11 8 | 6644 | −75 | 4 | +14 | 73 | 388 | 7 | F | U. S. Naval. |
| | | 6646 | −42 | 37 | −5 | 43 | 24 | 5 | | |
| | | 6645 | −19 | 60 | −5 | 23 | 24 | 2 | | |
| | | 6642 | +5 | 84 | +11 | 7 | 291 | 26 | | |
| | | 6641 | +9 | 88 | −20 | 27 | 388 | 27 | | |
| | | 6638 | +54 | 133 | +19 | 54 | 121 | 7 | | |
| | | 6635 | +64 | 143 | −20 | 70 | 73 | 1 | | |
| | | | | (79) | (+6) | | 1,309 | 75 | | |
| Oct. 19... | 10 50 | 6648 | −85 | 341 | −9 | 86 | 1,212 | 8 | VG | Do. |
| | | 6647 | −70 | 356 | −12 | 71 | 194 | 3 | | |
| | | 6644 | −61 | 5 | +14 | 61 | 339 | 12 | | |
| | | 6646 | −28 | 38 | −5 | 31 | 145 | 13 | | |
| | | 6642 | +18 | 84 | +10 | 20 | 291 | 19 | | |
| | | 6641 | +23 | 89 | −20 | 33 | 436 | 30 | | |
| | | 6638 | +67 | 133 | +19 | 58 | 145 | 3 | | |
| | | 6635 | +78 | 144 | −20 | 79 | 48 | 1 | | |
| | | | | (66) | (+6) | | 2,810 | 89 | | |
| Oct. 20... | 11 11 | 6648 | −71 | 342 | −9 | 72 | 1,939 | 22 | VG | Do. |
| | | 6647 | −58 | 355 | −12 | 60 | 97 | 2 | | |
| | | 6644 | −48 | 5 | +14 | 49 | 145 | 12 | | |
| | | 6646 | −14 | 39 | −6 | 17 | 194 | 26 | | |
| | | 6642 | +32 | 85 | +10 | 33 | 145 | 10 | | |
| | | 6641 | +36 | 89 | −20 | 43 | 388 | 22 | | |
| | | 6638 | +82 | 135 | +19 | 82 | 145 | 1 | | |
| | | | | (53) | (+5) | | 3,053 | 95 | | |
| Oct. 21... | 10 46 | 6648 | −68 | 332 | −8 | 69 | 291 | 11 | G | Do. |
| | | 6648 | −59 | 341 | −8 | 60 | 1,794 | 25 | | |
| | | 6648 | −54 | 346 | −11 | 56 | 242 | 6 | | |
| | | 6647 | −45 | 355 | −12 | 47 | 73 | 2 | | |
| | | 6649 | −43 | 57 | −4 | 44 | 6 | 2 | | |
| | | 6644 | −35 | 5 | +14 | 36 | 170 | 10 | | |
| | | 6646 | −2 | 38 | −7 | 12 | 194 | 19 | | |
| | | 6642 | +46 | 86 | +10 | 47 | 97 | 6 | | |
| | | 6641 | +50 | 90 | −21 | 56 | 388 | 18 | | |
| | | | | (40) | (+5) | | 3,255 | 99 | | |
| Oct. 22... | 10 41 | 6652 | −76 | 311 | +12 | 75 | 436 | 10 | VG | Do. |
| | | 6648 | −54 | 333 | −8 | 56 | 194 | 18 | | |
| | | 6651 | −47 | 340 | −17 | 51 | 6 | 4 | | |
| | | 6648 | −46 | 341 | −18 | 49 | 1,454 | 27 | | |
| | | 6648 | −40 | 347 | −11 | 43 | 194 | 20 | | |
| | | 6649 | −34 | 353 | −4 | 36 | 48 | 8 | | |
| | | 6650 | −34 | 353 | −19 | 41 | 48 | 3 | | |
| | | 6647 | −31 | 356 | −12 | 35 | 48 | 3 | | |
| | | 6644 | −22 | 5 | +12 | 23 | 194 | 10 | | |
| | | 6646 | +14 | 41 | −8 | 19 | 97 | 6 | | |
| | | 6642 | +60 | 87 | +9 | 61 | 73 | 10 | | |
| | | 6641 | +64 | 91 | −21 | 67 | 485 | 21 | | |
| | | | | (27) | (+5) | | 3,277 | 145 | | |
| Oct. 23... | 10 48 | 6652 | −62 | 311 | +12 | 63 | 436 | 9 | G | Do. |
| | | 6648 | −42 | 331 | −8 | 44 | 145 | 10 | | |
| | | 6651 | −34 | 339 | −17 | 42 | 12 | 4 | | |
| | | 6648 | −32 | 341 | −8 | 35 | 1,454 | 28 | | |
| | | 6648 | −28 | 345 | −11 | 33 | 170 | 10 | | |
| | | 6649 | −20 | 353 | −4 | 22 | 24 | 3 | | |
| | | 6650 | −20 | 353 | −19 | 31 | 12 | 3 | | |
| | | 6647 | −18 | 355 | −12 | 25 | 48 | 2 | | |
| | | 6644 | −8 | 5 | +13 | 12 | 145 | 11 | | |
| | | 6653 | +27 | 40 | +8 | 27 | 48 | 4 | | |
| | | 6646 | +28 | 41 | −7 | 31 | 97 | 3 | | |
| | | 6642 | +74 | 87 | +9 | 74 | 73 | 1 | | |
| | | 6641 | +85 | 98 | −20 | 87 | 436 | 1 | | |
| | | | | (13) | (+5) | | 3,100 | 89 | | |
| Oct. 24... | 10 33 | 6652 | −49 | 311 | +12 | 50 | 436 | 13 | VG | Do. |
| | | 6648 | −30 | 330 | −8 | 33 | 97 | 9 | | |
| | | 6651 | −21 | 339 | −18 | 31 | 12 | 5 | | |
| | | 6648 | −18 | 342 | −8 | 23 | 1,454 | 47 | | |
| | | 6648 | −14 | 346 | −10 | 20 | 170 | 14 | | |
| | | 6649 | −10 | 350 | −4 | 14 | 12 | 3 | | |

## POSITIONS AND AREAS OF SUN SPOTS—Continued

| Date | Eastern standard time | Mount Wilson group No. | Heliographic: Difference in longitude | Heliographic: Longitude | Heliographic: Latitude | Heliographic: Distance from center of disk | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| *1939* | h m | | ° | ° | ° | ° | | | | |
| Oct. 24... | | 6650 | −8 | 352 | −18 | 23 | 12 | 1 | | U. S. Naval. |
| | | 6647 | −5 | 355 | −12 | 17 | 48 | 3 | | |
| | | 6644 | +3 | 3 | +13 | 8 | 145 | 23 | | |
| | | 6653 | +39 | 39 | +7 | 39 | 97 | 14 | | |
| | | 6646 | +41 | 41 | −7 | 43 | 97 | 1 | | |
| | | (*) | +61 | 61 | −6 | 63 | 24 | 5 | | |
| | | | | (360) | (+5) | | 2,604 | 138 | | |
| Oct. 25... | 19 17 | 6655 | −76 | 266 | +21 | 77 | 97 | 2 | F | Mt. Wilson. |
| | | 6652 | −32 | 310 | +14 | 34 | 339 | 11 | | |
| | | 6654 | −30 | 312 | +3 | 30 | 73 | 8 | | |
| | | 6648 | −12 | 330 | −8 | 17 | 97 | 9 | | |
| | | 6648 | −1 | 341 | −8 | 13 | 1,454 | 50 | | |
| | | 6648 | +4 | 346 | −10 | 15 | 97 | 11 | | |
| | | 6650 | +7 | 349 | −17 | 23 | 12 | 1 | | |
| | | 6649 | +9 | 351 | −4 | 13 | 24 | 4 | | |
| | | 6647 | +13 | 355 | −12 | 20 | 36 | 1 | | |
| | | 6644 | +20 | 2 | +14 | 22 | 73 | 12 | | |
| | | 6653 | +56 | 38 | +7 | 56 | 24 | 1 | | |
| | | 6646 | +59 | 41 | −7 | 60 | 48 | 6 | | |
| | | | | (342) | (+5) | | 2,374 | 116 | | |
| Oct. 26... | 11 8 | 6656 | −85 | 249 | −8 | 86 | 145 | 1 | G | U. S. Naval. |
| | | 6655 | −67 | 267 | +22 | 68 | 194 | 2 | | |
| | | 6652 | −23 | 311 | +14 | 25 | 242 | 8 | | |
| | | 6654 | −20 | 314 | +3 | 20 | 97 | 11 | | |
| | | 6648 | −2 | 332 | −8 | 12 | 73 | 9 | | |
| | | 6648 | +8 | 342 | −8 | 16 | 1,333 | 66 | | |
| | | 6648 | +14 | 348 | −10 | 15 | 73 | 1 | | |
| | | 6649 | +20 | 354 | −4 | 23 | 12 | 3 | | |
| | | 6647 | +22 | 356 | −12 | 27 | 36 | 1 | | |
| | | 6644 | +31 | 5 | +14 | 33 | 73 | 9 | | |
| | | 6653 | +65 | 39 | +7 | 64 | 97 | 10 | | |
| | | 6646 | +69 | 43 | −7 | 68 | 97 | 1 | | |
| | | | | (334) | (+5) | | 2,472 | 122 | | |
| Oct. 27... | 14 40 | 6656 | −69 | 250 | −8 | 68 | 218 | 1 | VG | Do. |
| | | 6655 | −52 | 267 | +22 | 53 | 194 | 1 | | |
| | | 6652 | −9 | 310 | +15 | 14 | 291 | 8 | | |
| | | 6654 | −6 | 313 | +2 | 6 | 48 | 8 | | |
| | | 6648 | +13 | 332 | −9 | 17 | 48 | 9 | | |
| | | 6648 | +19 | 338 | −8 | 23 | 73 | 7 | | |
| | | 6648 | +25 | 344 | −8 | 27 | 1,067 | 40 | | |
| | | 6648 | +29 | 348 | −10 | 33 | 73 | 1 | | |
| | | 6647 | +37 | 356 | −12 | 42 | 24 | 1 | | |
| | | 6644 | +45 | 4 | +14 | 46 | 12 | 3 | | |
| | | 6646 | +86 | 45 | −7 | 88 | 97 | 1 | | |
| | | | | (319) | (+5) | | 2,145 | 80 | | |
| Oct. 28... | 10 32 | 6656 | −63 | 245 | −11 | 65 | 48 | 8 | G | Do. |
| | | 6656 | −58 | 250 | −8 | 60 | 218 | 3 | | |
| | | 6657 | −50 | 258 | +5 | 51 | 24 | 1 | | |
| | | 6655 | −40 | 268 | +22 | 43 | 194 | 5 | | |
| | | 6652 | +3 | 311 | +15 | 11 | 291 | 16 | | |
| | | 6654 | +7 | 315 | +2 | 8 | 24 | 8 | | |
| | | 6648 | +25 | 333 | −8 | 28 | 48 | 6 | | |
| | | 6648 | +30 | 338 | −8 | 33 | 73 | 9 | | |
| | | 6648 | +36 | 344 | −8 | 38 | 970 | 33 | | |
| | | 6648 | +40 | 348 | −9 | 43 | 73 | 4 | | |
| | | 6647 | +49 | 357 | −12 | 52 | 24 | 1 | | |
| | | | | (308) | (+5) | | 1,987 | 94 | | |
| Oct. 29... | 10 52 | 6658 | −71 | 223 | −14 | 73 | 48 | 2 | VG | Mt. Wilson. |
| | | 6656 | −47 | 247 | −10 | 50 | 24 | 8 | | |
| | | 6656 | −43 | 251 | −6 | 45 | 218 | 2 | | |
| | | 6657 | −38 | 256 | +5 | 38 | 194 | 21 | | |
| | | 6655 | −28 | 266 | +21 | 33 | 194 | 5 | | |
| | | 6652 | +17 | 311 | +15 | 20 | 218 | 9 | | |
| | | 6654 | +24 | 318 | +3 | 24 | 6 | 2 | | |
| | | 6648 | +44 | 338 | −8 | 46 | 48 | 5 | | |
| | | 6648 | +49 | 343 | −9 | 51 | 921 | 30 | | |
| | | 6648 | +53 | 347 | −9 | 54 | 73 | 3 | | |
| | | 6647 | +63 | 357 | −12 | 65 | 12 | 1 | | |
| | | | | (294) | (+5) | | 1,956 | 88 | | |

## POSITIONS AND AREAS OF SUN SPOTS—Continued

| Date | Eastern standard time | Mount Wilson group No. | Heliographic | | | | Area of spot or group | Spot count | Plate quality | Observatory |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Difference in longitude | Longitude | Latitude | Distance from center of disk | | | | |
| *1939* | h m | | ° | ° | ° | ° | | | | |
| Oct. 30... | 10 39 | 6658 | −58 | 223 | −14 | 62 | 12 | 2 | VG | Mt. Wilson. |
| | | 6656 | −32 | 249 | −10 | 34 | 48 | 9 | | |
| | | 6655 | −30 | 251 | −7 | 33 | 194 | 8 | | |
| | | 6657 | −25 | 256 | +5 | 25 | 824 | 52 | | |
| | | 6655 | −15 | 266 | +22 | 23 | 194 | 14 | | |
| | | 6652 | +29 | 310 | +14 | 31 | 145 | 14 | | |
| | | 6654 | +33 | 314 | +4 | 34 | 6 | 3 | | |
| | | 6648 | +57 | 338 | −8 | 58 | 24 | 2 | | |
| | | 6648 | +63 | 344 | −9 | 64 | 727 | 20 | | |
| | | 6648 | +68 | 349 | −9 | 70 | 73 | 7 | | |
| | | | | (281) | (+5) | | 2,247 | 131 | | |
| Oct. 31... | 11 7 | 6660 | −68 | 200 | +22 | 69 | 16 | 3 | P | Do. |
| | | 6658 | −45 | 223 | −14 | 49 | 12 | 2 | | |
| | | 6656 | −19 | 249 | −10 | 24 | 48 | 6 | | |
| | | 6656 | −17 | 251 | −7 | 20 | 170 | 4 | | |
| | | 6657 | −11 | 257 | +7 | 16 | 679 | 30 | | |
| | | 6655 | −3 | 265 | +22 | 18 | 145 | 6 | | |
| | | 6659 | +48 | 316 | −6 | 50 | 6 | 1 | | |
| | | 6648 | +78 | 346 | −8 | 80 | 582 | 9 | | |
| | | | | (268) | (+4) | | 1,658 | 61 | | |

Mean daily area for 29 days=2,131.

*=not numbered.
VG=very good; G=good; F=fair; P=poor.

## PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR OCTOBER 1939

[Dependent alone on observations at Zurich]

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

| October 1939 | Relative numbers | October 1939 | Relative numbers | October 1939 | Relative numbers |
|---|---|---|---|---|---|
| 1 | *ad* 144 | 11 | 56 | 21 | *a* — |
| 2 | *a* 143 | 12 | *Eac* — | 22 | *d* 94 |
| 3 | | 13 | *a* — | 23 | |
| 4 | *aa* 92 | 14 | *Eac* 68 | 24 | *a* 112 |
| 5 | | 15 | *Ec* 73 | 25 | *bd* — |
| 6 | *ad* — | 16 | 68 | 26 | *d* 100 |
| 7 | | 17 | *a* 79 | 27 | |
| 8 | *d* — | 18 | *Eacd* 74 | 28 | *a* 64 |
| 9 | 77 | 19 | *d* 92 | 29 | *Ec* 81 |
| 10 | 67 | 20 | 95 | 30 | 85 |
| | | | | 31 | *a* — |

Mean, 19 days=87.6

*a*=Passage of an average-sized group through the central meridian.
*b*=Passage of a large group through the central meridian.
*c*=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the center-circle zone.
*d*=Entrance of a large or average-sized center of activity on the east limb.

# AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in charge]

By B. FRANCIS DASHIELL

The establishment of a widespread network of radiosonde observations became an accomplished fact during October with the opening of additional stations at Juneau and Fairbanks, Alaska, and Lakehurst, N. J.; the latter being changed by the United States Navy from an airplane station. For the first time, regularly scheduled daily observations of pressure, temperature and humidity, in the high levels above 28 radiosonde stations, extended from Alaska to the Caribbean. These stations are listed in table 1a, and the observations of the United States Navy by airplanes at 7 stations are given in table 1. Charts VIII, IX, X, and XI show the mean pressures and temperatures, as well as the resultant winds, at 1.5, 3, 4, and 5 kilometers, respectively. The pressures shown on chart VIII are for 5,000 feet only. Tables 2 and 3 list certain wind data, and table 4 shows the heights of the tropopauses. Isentropic data for October are shown on chart XII. A detailed description of the charts and tables was given in the January 1939 issue of the MONTHLY WEATHER REVIEW.

The mean free-air pressures for the current month for 5,000 feet, and 3, 4, and 5 kilometers, were well distributed. Highest pressure was indicated over the Southeast, being located at Pensacola, Fla., at 5,000 feet, and 3 and 4 kilometers, and over Miami, Fla., at 5 kilometers. Lowest mean pressure existed over the northern portion of the United States, being indicated at Sault Ste. Marie, Mich. To the south of the high-pressure area diminishing pressures were noted over Puerto Rico and Swan Island. Above 5 kilometers, where observations were made by radiosondes, lowest pressures prevailed along the northern border. These were centered over Sault Ste. Marie, Mich., up to 14 kilometers, and over Bismarck, N. Dak., in the higher levels. Lowest pressures occurred over Alaska, being lower at Fairbanks than at any station in the United States. Above 5 kilometers the highest mean pressures were noted over Miami, Fla., up to 11 kilometers, and then equalled by San Juan, P. R. Pressures over Swan Island were lower than those recorded at either Miami, Fla., or San Juan, P. R.

Mean pressures at stations using radiosonde in 1938 showed the current month to be lower than in October 1938 at all levels over Nashville, Tenn., Oklahoma City, Okla., Omaha, Nebr., and Sault Ste. Marie, Mich. The pressures at Nashville, Tenn., were very little lower than the previous year, but those at Sault Ste. Marie, Mich. became lower by a difference of 5 millibars at the surface to 10 millibars at 8 kilometers, then decreased with altitude to 2 millibars at 18 kilometers. Over Oakland, Calif., the current mean pressure was higher than in 1938 from the surface up to 11 kilometers, and then lower above. At Washington, D. C., the 1939 means were higher at all levels, the difference also becoming greatest at 8 kilometers.

During October the pressure differences at all levels between the southeastern HIGH (Miami, Fla.), and the northern LOW (Sault Ste. Marie, Mich.), showed a gradient increasing with altitude from 4 millibars at 500 meters to 25 millibars at 8 kilometers, and decreasing with additional altitude to 6 millibars at the maximum height of 17 kilometers. Also, a parallel case existed between the low-pressure area over Sault Ste. Marie, Mich., and the still lower one over Fairbanks, Alaska. In both cases the maximum gradient in millibars occurred at 8 kilometers. The pressure differences in millibars for all levels averaged 45 percent of those noted between Miami, Fla., and Sault Ste. Marie, Mich. And, as an interesting incidental, the difference in latitude between Fairbanks, Alaska, and Sault Ste. Marie, Mich., also is 45 percent of the difference between the latter place and Miami, Fla.

Mean relative humidities were high in the northern sections of the country (Sault Ste. Marie, Mich., Billings, Mont., Bismarck, N. Dak., and Spokane, Wash.). But outside of the United States proper the highest humidities

were recorded over Juneau and Fairbanks, Alaska, San Juan, P. R., and Swan Island. Elsewhere humidities were only moderately high, with the exception of the central States and the far Southwest. San Diego, Calif., Phoenix, Ariz., and El Paso, Tex., reported the lowest mean relative humidities recorded in the upper air during October.

Mean free-air temperatures for October were lower than those recorded in September at all levels up to an average of 14 kilometers, and higher than the preceding month at all levels above 14 kilometers. Oakland, Calif., Medford, Oreg., Spokane, Wash., and Atlanta, Ga., were the only exceptions, as these stations were colder in October at all levels. At Miami, Fla., the October mean temperature became warmer at 2.5 kilometers and remained so up to 16 kilometers, when it again became colder. Radiosonde temperatures at San Juan, P. R., showed that October was warmer than September at 6 to 12 kilometers only, while Swan Island was warmer up to 15 kilometers, and then colder above.

Comparing the October means at the 6 stations having radiosonde records for both 1938 and 1939 (Nashville, Tenn., Oakland, Calif., Oklahoma City, Okla., Omaha, Nebr., Sault Ste. Marie, Mich., and Washington, D. C.) it was found that the current month was generally colder than in October 1938. However, at Oakland, Calif., the October 1939 temperatures were warmer up to 6 kilometers and then colder above, while at Sault Ste. Marie, Mich., it was colder up to 12 kilometers and warmer above. Washington, D. C., was currently warmer at all levels up to 11 kilometers, and then colder above.

At 1.5 kilometers the mean free-air temperatures (chart VIII) were higher than 0° C. over the entire United States. The warmest occurred over San Juan, P. R., Miami, Fla., and El Paso, Tex., while the coldest was over Sault Ste. Marie, Mich. But at Fairbanks and Juneau, Alaska, below-zero mean temperatures were noted (−9.8° C. and −3.3° C., respectively). The level of 0° C. mean free-air temperature sloped upward toward the South from approximately 900 meters over Juneau, Alaska, to 1.6 kilometers over Sault Ste. Marie, Mich., 3.8 kilometers over Nashville, Tenn., and 4.9 kilometers over Miami, Fla., and San Juan, P. R. At 5 kilometers all stations reported below-zero (0° C.) temperatures.

Above 5 kilometers lowest temperatures were found over the southern stations in the higher levels, while the northern stations remained coldest at the lower levels. Fairbanks, Alaska, reported a mean of −53.9° C. at 10 kilometers, while Swan Island had −78 7° C. at 18 kilokilometers. Intermediate radiosonde stations along a vertical cross section extending from Spokane, Wash , to Miami, Fla., showed a steady decrease in mean minimum temperatures as the altitude increased.

The highest individual minimum temperature recorded during October was −61.2° C. on the 6th at 12 kilometers over Juneau, Alaska, while the lowest of −85.1° C. over Swan Island at 18 kilometers on the 30th was close to the lowest outdoor temperature ever recorded. Elsewhere, low individual temperatures occurred at 17 kilometers over San Juan, P. R. (−81.3° C.), on the 15th; Atlanta, Ga. (−80.6° C.), on the 27th; Miami, Fla. (−77.0° C.), on the 21st; El Paso, Tex. (−77.0° C.), on the 29th; and Denver, Colo. (−70.6° C.), on the 22nd. Also, low temperatures were noted at 16 kilometers over St. Louis, Mo. (−73.5° C.), on the 9th; and Oakland, Calif. (−70.3° C.), on the 22d; and over Sault Ste. Marie, Mich. (−67.1° C.) on the 9th, at 14 kilometers.

The resultant winds for the current month, computed for 1.5, 3, 4, and 5 kilometers, are shown in charts VIII, IX, X, and XI, respectively. In most cases the directions for October were more northerly than during the preceding seasonal summer and autumn months. Pilot-balloon observations made in October failed generally to equal the maximum altitudes reached during the several months immediately preceding. However, there were a number of excellent observations made during the month. All pilot-balloon stations reached 5 kilometers as a maximum, while 68, 18, and 7 percent exceeded 10, 15, and 20 kilometers, respectively. The highest individual altitudes were reached over Abilene, Tex., Miami, Fla., and Redding, Calif. (26.7, 22.9, and 20.3 kilometers, respectively), on the 13th. The first days of October were favorable for high balloon observations over the Great Lakes region; the 15th along the Mississippi and Ohio Valleys; and on the 16th over the Northeast. At many of these maximum altitudes northeasterly winds were encountered over the Southeastern States, as well as the central portions of the Pacific Coast and Rocky Mountain States.

At 1.5 kilometers (chart VIII) the resultant-wind directions, based on 5 a. m., 75th meridian time observations, were northwesterly over a belt extending from the Northwest to the Atlantic coast. Southeasterly winds over Florida and Cuba turned clockwise to become westerly over Louisiana, Alabama, and Georgia. This circulation was due to the high-pressure area centered over Pensacola, Fla. Winds in the far West appeared confused, where very light velocities were noted (Reno, Nev., 0.2 m. p. s.). Elsewhere, resultant velocities were higher than previous months, except over the east Gulf region. Highest wind speeds occurred from northern Texas to the Great Lakes and New England, reaching a maximum for the country at Albany, N. Y. (12.7 m. p. s.).

The October wind directions at 1.5 kilometers backed from normal by counterclockwise rotations over the eastern half of the country, and turned by clockwise rotations over the West, except at Medford, Oreg., and Spokane, Wash. The largest departures from normal occurred over San Diego, Calif. (134° clockwise rotation from normal), Houston, Tex. (104° clockwise), Seattle, Wash. (57° clockwise), and Atlanta, Ga. (46° counterclockwise). The departures from the normally light wind velocities were positive but small. Elsewhere, the current velocities were greater than normal over all stations, with the exception of Medford, Oreg., and Seattle, Wash., where they were less than normal. Positive departures of more than 3 m. p. s. occurred over the entire central portion of the United States at this level.

The resultant winds at 3 kilometers, also based on 5 a. m. observations (chart IX), showed that northwesterly directions predominated. However, the anticyclonic circulation continued to persist over the Southeast, with Miami, Fla., and Key West, Fla., reporting directions of 123° and 117°, respectively. Winds on the Pacific coast showed more definite directions at 3 kilometers with velocities exceeding those noted at 1.5 kilometers. High resultant velocities prevailed elsewhere in the country, except the extreme South and Southwest. Again the highest resultant wind speed in the country occurred over Albany, N. Y. (17.6 m. p. s.).

At 3 kilometers the current winds were oriented by departing from the normal in small counterclockwise rotations, except at San Diego, Calif., and Houston, Tex., where the departure differences were 178° and 110°, respectively. Clockwise departures were noted only at Medford, Oreg., Spokane, Wash., and Key West, Fla. The October velocities were larger than normal elsewhere, except over Houston, Tex., and Atlanta, Ga., where the departures were less than normal.

Chart X shows resultant winds at 4 kilometers based on observations made at 5 p. m. Northwesterly winds predominated at this level over all but the extreme southern portion of the United States, and Cuba and Mexico. Some indications of the anticyclone noted in the lower levels remained at 4 kilometers over Cuba, Puerto Rico, and southern Florida. Resultant velocities greater than 5 m. p. s. occurred over the entire country, except along the immediate Gulf coast and the extreme Southwest including California. Velocities over 15 m. p. s. prevailed west of the Great Lakes and in New England. Albany, N. Y., again had an outstanding velocity of 16.6 m. p. s., but this was surpassed by 18.0 m. p. s. recorded over Hartford, Conn.

Resultant winds at 5 kilometers are shown on chart XI. The directions showed definite northwesterly resultants over the United States with the exception of the extreme South. Indications of the anticyclonic circulation appeared over and southeast of southern Florida. Winds over California showed outstanding northerly tendencies. Resultant velocities at 5 kilometers were slightly higher than at 4 kilometers, but extreme velocities occurred over the North, particularly west of the Great Lakes (Milwaukee, Wis., 20.0 m. p. s., Fargo, N. Dak., 19.2 m. p. s., and Huron, S. Dak., 18.7 m. p. s.).

Comparing the current 5 p. m. winds with established 5 a. m. normals at 4 kilometers, it was found that the directions departed from normal in counterclockwise rotations east of the Rocky Mountains, and clockwise west of the Rockies. Outstanding departures from normal were noted over San Diego, Calif. (108° clockwise), Oakland, Calif. (58° clockwise), and Houston, Tex. (59° counterclockwise). But at 5 kilometers counterclockwise departures occurred over the entire southern half of the country, and clockwise departures over the northern portion. The largest difference noted was 47° (counterclockwise) at Houston, Tex. Resultant velocities for October exceeded the normal by more than 5 m. p. s. over the nothern part of the United States at 4 kilometers (+9.0 m. p. s. at Fargo, N. Dak.), and along a belt reaching from the far Northwest (+9.5 m. p. s. at Billings, Mont.) to the extreme Southeast (+5.7 m. p. s. at Atlanta, Ga.) at 5 kilometers.

In the higher levels, resultant winds, based on 5 p. m. observations (table 2), were northwesterly, except in the far South. At 6 kilometers, northwesterly winds in the far West became westerly over the East. Velocities were slightly higher than those noted at 4 and 5 kilometers. Resultant wind speeds of 21.9 m. p. s. and 18.2 m. p. s. were recorded over Fargo, N. Dak., and Omaha, Nebr., respectively.

At 8 kilometers the winds were unchanged except for direction at Miami, Fla., which shifted from the southwest into the northwest quadrant. Velocities were higher in the South at this level (Miami, Fla., 6.1 m. p. s.) than at 6 kilometers, but the maximum occurred over Huron, S. Dak. (19.2 m. p. s.). There were few changes in direction at 10 kilometers, except for southwesterly winds that reappeared over Little Rock, Ark., Oklahoma City, Okla., and Albuquerque, N. Mex. At this level high velocities occurred over Houston, Tex. (23.2 m. p. s.), Atlanta, Ga. (22.1 m. p. s.), and Cheyenne, Wyo. (22.1 m. p. s.). The velocities at Winslow, Ariz. (8.3 m. p. s.), and Las Vegas, Nev. (8.1 m. p. s.), were unusually light for 10 kilometers, and remained so up to 16 kilometers.

Diurnal changes in direction between 5 a. m. and 5 p. m. resultant winds (charts VIII and IX, and table 2, respectively) at 1.5 and 3 kilometers for October were noteworthy. The 5 p. m. winds turned away from the 5 a. m. directions through counterclockwise rotations over all of the country except the extreme Southeast and far middle West at 1.5 kilometers, and over the South and Pacific slope at 3 kilometers, where departures were by clockwise rotations. Largest diurnal direction changes took place along the west Gulf coast and far Southwest at both 1.5 and 3 kilometers, being outstanding at Las Vegas, Nev., Brownsville, Tex., and San Diego, Calif. The afternoon resultant velocities were less than the 5 a. m. over most of the country, except in the far Southeast and Southwest at 1.5 kilometers, while opposite velocity departures occurred over the same areas at 3 kilometers.

Table 3 lists the individual maximum wind velocities recorded over the United States during October. The winds of 42.2 m. p. s. at Las Vegas, Nev., 62.8 m. p. s. at Hartford, Conn., and 77.5 m. p. s. over Omaha, Nebr., at 2.1, 4.2, and 13.4 kilometers, respectively, were the highest recorded since June 1939.

### MEAN MONTHLY ISENTROPIC CHART [1]

In the mean isentropic chart, $\theta=306°$, for October 1939 (chart XII), the westerlies cover the northern two-thirds of the United States, while an anticyclonic eddy of small dimensions and slight moisture contrasts is centered over eastern Texas.

The dry current over the middle Gulf States may be associated with the deficiency of precipitation there. Elsewhere too little is known of the normal isentropic flow pattern for October to indicate any correlation between the precipitation departures and the mean pattern for this month. With the seasonal change from predominantly convective precipitation in summer, when the moisture conditions aloft are rather stationary and determine the regions of shower activity, to the frontal precipitation of winter, when the moist currents move across the map rapidly, little correlation may be expected to exist.

In studying chart XII, it will be noted that the moisture and pressure lines bulge southward over the Great Lakes in a fashion similar to the pattern normally occurring on summer charts. The fact that the precipitation departures in this region are small suggests that this configuration of the lines is normal for autumn also, and that in the Great Lakes region the precipitation usually occurs at lower temperatures than at the same latitudes elsewhere in the country.

The precipitation excesses in the Middle Atlantic States and southern New England occurred in connection with wave disturbances passing northward along the coast on three occasions during the month. The precipitation occurred with the affected stations in the cold air, but the moisture aloft in connection with it shows up as a bending of the condensation pressure lines northward across the isobars over the region affected, with indication of a moist tongue to the east over the ocean.

[1] Prepared by the Division of Research and Education.

TABLE 8.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in °C., and relative humidities (R. H.), in percent, obtained by airplanes during October 1939*

| Stations and elevations in meters above sea level | Altitude (meters) m. s. l. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | | | | 500 | | | 1,000 | | | 1,500 | | | 2,000 | | | 2,500 | | | 3,000 | | | 4,000 | | | 5,000 | | |
| | Number of observations | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. |
| Coco Solo, C. Z. (15 m.) | 24 | 1,010 | 25.1 | 94 | 952 | 23.8 | 85 | 904 | 21.4 | 86 | 853 | 19.1 | 87 | 804 | 17.0 | 83 | 759 | 14.9 | 77 | 715 | 12.6 | 72 | 635 | 7.6 | 72 | ---- | ---- | ---- |
| Norfolk, Va. (10 m.) | 24 | 1,020 | 14.8 | 80 | 962 | 15.8 | 67 | 907 | 13.1 | 63 | 855 | 11.1 | 57 | 805 | 8.8 | 54 | 758 | 6.3 | 51 | 713 | 4.2 | 47 | 630 | −2.4 | 45 | 554 | −9.4 | 44 |
| Pearl Harbor, T. H. (6 m.) | 31 | 1,015 | 22.7 | 85 | 960 | 20.5 | 80 | 906 | 16.7 | 84 | 854 | 14.1 | 79 | 805 | 12.1 | 67 | 758 | 10.5 | 51 | 714 | 8.2 | 39 | 631 | 2.2 | 31 | ---- | ---- | ---- |
| Pensacola, Fla. (13 m.) | 31 | 1,018 | 17.4 | 86 | 962 | 19.2 | 71 | 907 | 17.2 | 65 | 855 | 14.9 | 62 | 806 | 13.1 | 52 | 760 | 11.0 | 47 | 716 | 8.5 | 48 | 634 | 2.7 | 46 | 559 | −3.9 | 44 |
| St. Thomas, V. I. (8 m.) | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| San Diego, Calif. (10 m.) | 30 | 1,013 | 16.6 | 75 | 957 | 19.1 | 57 | 903 | 17.7 | 48 | 851 | 15.2 | 40 | 802 | 12.6 | 35 | 755 | 10.2 | 28 | 711 | 7.4 | 24 | 629 | 1.5 | 19 | 555 | −5.2 | 19 |
| Seattle, Wash. (10 m.) | 16 | 1,020 | 11.4 | 82 | 963 | 10.1 | 76 | 907 | 9.5 | 63 | 854 | 7.8 | 59 | 803 | 6.2 | 50 | 755 | 4.4 | 50 | 711 | 2.1 | 52 | 626 | −4.1 | 47 | ---- | ---- | ---- |

Observations made by U. S. Navy, and taken at 4 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are made at dawn.
NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in °C., and relative humidities (R. H.) in percent obtained by radiosonde during October 1939*

| Altitude (meters) m. s. l. | Stations and elevations in meters above sea level | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Albuquerque, N. Mex. (1,621 m.) | | | | Atlanta, Ga. (298 m.) | | | | Billings, Mont. (1,089 m.) | | | | Bismarck, N. Dak. (508 m.) | | | | Boise, Idaho (824 m.) | | | | Buffalo, N. Y. (219 m.) | | | | Charleston, S. C. (14 m.) | | | |
| | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T | R. H. |
| Surface | 29 | 840 | 10.2 | 48 | 31 | 984 | 13.4 | 84 | 30 | 892 | 7.2 | 65 | 30 | 955 | 3.0 | 75 | 30 | 923 | 7.0 | 84 | 30 | 990 | 8.5 | 82 | 31 | 1,016 | 15.4 | 89 |
| 500 | ---- | ---- | ---- | ---- | 31 | 961 | 16.3 | 72 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 30 | 958 | 8.4 | 79 | 31 | 961 | 18.1 | 67 |
| 1,000 | ---- | ---- | ---- | ---- | 31 | 906 | 14.8 | 70 | ---- | ---- | ---- | ---- | 30 | 899 | 5.5 | 64 | 30 | 904 | 10.0 | 70 | 30 | 901 | 6.2 | 77 | 31 | 906 | 16.6 | 62 |
| 1,500 | ---- | ---- | ---- | ---- | 31 | 854 | 12.3 | 67 | 30 | 849 | 8.6 | 58 | 30 | 846 | 4.0 | 58 | 30 | 852 | 9.4 | 60 | 30 | 847 | 3.6 | 77 | 31 | 854 | 13.8 | 61 |
| 2,000 | 29 | 803 | 11.2 | 45 | 31 | 804 | 10.3 | 59 | 30 | 798 | 5.7 | 57 | 30 | 795 | 2.3 | 57 | 30 | 801 | 6.6 | 57 | 30 | 796 | 1.5 | 70 | 31 | 805 | 12.1 | 52 |
| 2,500 | 29 | 756 | 8.3 | 45 | 31 | 757 | 8.2 | 51 | 30 | 750 | 2.5 | 57 | 30 | 747 | 0.0 | 56 | 30 | 754 | 3.3 | 58 | 30 | 748 | −0.6 | 63 | 31 | 758 | 10.0 | 46 |
| 3,000 | 29 | 711 | 4.8 | 44 | 31 | 712 | 5.7 | 45 | 30 | 706 | −0.5 | 60 | 30 | 702 | −2.7 | 54 | 30 | 708 | 0.0 | 58 | 30 | 703 | −3.1 | 58 | 31 | 714 | 7.3 | 44 |
| 4,000 | 27 | 628 | −1.3 | 42 | 31 | 630 | 0.8 | 37 | 30 | 622 | −6.9 | 64 | 29 | 618 | −8.5 | 57 | 30 | 625 | −5.8 | 54 | 30 | 619 | −8.5 | 59 | 29 | 632 | 2.2 | 38 |
| 5,000 | 27 | 553 | −7.9 | 40 | 29 | 556 | −5.1 | 31 | 30 | 546 | −13.0 | 62 | 28 | 542 | −14.7 | 59 | 30 | 549 | −11.9 | 53 | 30 | 543 | −14.1 | 51 | 28 | 558 | −3.8 | 35 |
| 6,000 | 27 | 486 | −14.3 | 36 | 29 | 488 | −11.6 | 29 | 29 | 478 | −19.8 | 60 | 28 | 474 | −21.2 | 56 | 30 | 481 | −18.5 | 50 | 30 | 475 | −20.4 | 50 | 28 | 490 | −10.0 | 31 |
| 7,000 | 27 | 425 | −21.5 | 34 | 29 | 428 | −18.1 | 28 | 28 | 417 | −27.2 | 56 | 26 | 413 | −28.6 | 54 | 30 | 420 | −26.2 | 49 | 29 | 414 | −27.5 | 50 | 26 | 430 | −16.5 | 31 |
| 8,000 | 27 | 370 | −29.1 | 33 | 29 | 374 | −25.5 | 28 | 28 | 362 | −35.0 | 54 | 25 | 359 | −36.4 | 53 | 30 | 365 | −34.1 | 49 | 29 | 360 | −35.1 | 51 | 25 | 376 | −23.7 | 29 |
| 9,000 | 27 | 321 | −36.2 | 33 | 28 | 325 | −32.7 | 28 | 28 | 313 | −42.8 | ---- | 23 | 309 | −44.1 | ---- | 30 | 316 | −42.2 | 48 | 29 | 311 | −42.0 | 50 | 25 | 326 | −31.1 | 29 |
| 10,000 | 27 | 277 | −43.0 | 33 | 28 | 281 | −40.1 | 27 | 28 | 269 | −50.1 | ---- | 23 | 266 | −50.4 | ---- | 29 | 272 | −49.9 | ---- | 26 | 268 | −48.3 | ---- | 25 | 283 | −39.0 | 28 |
| 11,000 | 26 | 238 | −49.6 | ---- | 28 | 242 | −47.5 | ---- | 28 | 231 | −55.4 | ---- | 22 | 228 | −54.7 | ---- | 29 | 233 | −55.1 | ---- | 26 | 230 | −53.6 | ---- | 24 | 244 | −46.7 | ---- |
| 12,000 | 23 | 204 | −55.0 | ---- | 28 | 208 | −54.0 | ---- | 28 | 197 | −57.9 | ---- | 22 | 194 | −57.5 | ---- | 29 | 199 | −58.4 | ---- | 26 | 196 | −57.5 | ---- | 23 | 209 | −53.4 | ---- |
| 13,000 | 21 | 174 | −59.5 | ---- | 28 | 178 | −59.3 | ---- | 28 | 168 | −58.0 | ---- | 22 | 166 | −58.5 | ---- | 28 | 169 | −59.9 | ---- | 25 | 167 | −59.2 | ---- | 22 | 179 | −58.7 | ---- |
| 14,000 | 20 | 148 | −62.8 | ---- | 28 | 151 | −64.0 | ---- | 28 | 143 | −59.1 | ---- | 21 | 141 | −58.1 | ---- | 28 | 144 | −61.3 | ---- | 24 | 142 | −60.4 | ---- | 19 | 152 | −63.0 | ---- |
| 15,000 | 19 | 125 | −64.9 | ---- | 28 | 128 | −68.2 | ---- | 28 | 122 | −59.8 | ---- | 19 | 120 | −58.7 | ---- | 27 | 123 | −62.5 | ---- | 23 | 121 | −62.1 | ---- | 18 | 129 | −66.9 | ---- |
| 16,000 | 16 | 106 | −66.5 | ---- | 28 | 109 | −70.7 | ---- | 28 | 104 | −60.1 | ---- | 19 | 103 | −58.9 | ---- | 26 | 104 | −62.7 | ---- | 22 | 103 | −62.6 | ---- | 15 | 109 | −69.7 | ---- |
| 17,000 | 15 | 90 | −66.7 | ---- | 28 | 92 | −70.5 | ---- | 26 | 89 | −59.9 | ---- | 17 | 87 | −58.8 | ---- | 24 | 88 | −61.8 | ---- | 21 | 87 | −62.0 | ---- | 14 | 92 | −69.7 | ---- |
| 18,000 | 10 | 76 | −65.8 | ---- | 25 | 77 | −69.2 | ---- | 20 | 76 | −59.6 | ---- | 14 | 74 | −58.0 | ---- | 18 | 75 | −60.6 | ---- | 13 | 74 | −60.6 | ---- | 11 | 77 | −68.1 | ---- |
| 19,000 | ---- | ---- | ---- | ---- | 22 | 66 | −66.5 | ---- | 16 | 64 | −58.8 | ---- | 9 | 63 | −57.5 | ---- | 14 | 64 | −59.7 | ---- | 13 | 63 | −59.1 | ---- | 10 | 66 | −65.3 | ---- |
| 20,000 | ---- | ---- | ---- | ---- | 16 | 55 | −63.5 | ---- | 5 | 55 | −58.2 | ---- | ---- | ---- | ---- | ---- | 9 | 54 | −58.4 | ---- | 5 | 53 | −57.2 | ---- | 8 | 55 | −62.3 | ---- |
| 21,000 | ---- | ---- | ---- | ---- | 7 | 47 | −61.0 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 6 | 46 | −57.7 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 22,000 | ---- | ---- | ---- | ---- | 6 | 40 | −58.9 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |

| Altitude (meters) m. s. l. | Stations and elevations in meters above sea level | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Denver, Colo. (1,616 m.) | | | | El Paso, Tex. (1,194 m.) | | | | Ely, Nev. (1,909 m.) | | | | Fairbanks, Alaska (152 m.) | | | | Joliet, Ill. (178 m.) | | | | Juneau, Alaska (49 m.) | | | | Lakehurst, N. J. (39 m.) | | | |
| | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. |
| Surface | 30 | 838 | 6.6 | 52 | 31 | 884 | 13.7 | 52 | 29 | 813 | 1.9 | 76 | 30 | 990 | −5.6 | 74 | 30 | 995 | 8.8 | 80 | 30 | 1,004 | 4.7 | 82 | 31 | 1,012 | 9.8 | 86 |
| 500 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 30 | 947 | −6.3 | 77 | 30 | 956 | 10.7 | 66 | 30 | 950 | 2.3 | 84 | 31 | 958 | 11.0 | 66 |
| 1,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 30 | 889 | −8.2 | 77 | 30 | 901 | 9.0 | 60 | 30 | 893 | −0.7 | 86 | 31 | 903 | 9.4 | 61 |
| 1,500 | ---- | ---- | ---- | ---- | 31 | 853 | 16.5 | 45 | ---- | ---- | ---- | ---- | 30 | 833 | −9.8 | 76 | 30 | 848 | 6.7 | 56 | 30 | 838 | −3.3 | 87 | 31 | 851 | 7.7 | 58 |
| 2,000 | 30 | 800 | 11.2 | 46 | 31 | 804 | 13.8 | 42 | 29 | 803 | 4.3 | 69 | 30 | 780 | −12.3 | 78 | 30 | 798 | 5.0 | 53 | 30 | 787 | −5.8 | 87 | 31 | 801 | 5.9 | 52 |
| 2,500 | 30 | 754 | 8.6 | 43 | 31 | 757 | 10.3 | 43 | 29 | 756 | 5.0 | 56 | 30 | 730 | −14.5 | 78 | 30 | 750 | 2.5 | 51 | 27 | 738 | −8.1 | 87 | 31 | 753 | 3.4 | 50 |
| 3,000 | 30 | 709 | 4.6 | 41 | 31 | 712 | 6.7 | 45 | 29 | 710 | 2.3 | 54 | 30 | 683 | −16.7 | 76 | 29 | 705 | −0.2 | 49 | 24 | 691 | −10.7 | 87 | 31 | 707 | 0.8 | 48 |
| 4,000 | 29 | 626 | −2.8 | 41 | 31 | 630 | 0.5 | 42 | 29 | 627 | −3.6 | 50 | 30 | 597 | −22.5 | 76 | 27 | 621 | −6.4 | 49 | 21 | 605 | −16.1 | 82 | 31 | 624 | −4.0 | 48 |
| 5,000 | 29 | 551 | −10.0 | 42 | 31 | 556 | −5.6 | 35 | 29 | 552 | −9.8 | 44 | 30 | 520 | −28.3 | 75 | 26 | 546 | −12.7 | 46 | 21 | 528 | −22.6 | 79 | 30 | 549 | −9.9 | 46 |
| 6,000 | 29 | 483 | −15.7 | 42 | 31 | 488 | −11.9 | 30 | 28 | 483 | −16.7 | 40 | 29 | 452 | −34.8 | 73 | 26 | 478 | −18.5 | 41 | 17 | 460 | −28.7 | 77 | 28 | 480 | −16.2 | 50 |
| 7,000 | 29 | 422 | −23.5 | 41 | 30 | 428 | −18.6 | 28 | 28 | 423 | −24.0 | 38 | 26 | 391 | −41.5 | 70 | 26 | 417 | −25.7 | 40 | 12 | 398 | −35.1 | 75 | 27 | 420 | −23.4 | 53 |
| 8,000 | 29 | 368 | −31.2 | 41 | 30 | 374 | −26.0 | 27 | 28 | 368 | −32.0 | 37 | 25 | 336 | −47.6 | 65 | 26 | 362 | −38.0 | 40 | 11 | 344 | −40.9 | ---- | 26 | 366 | −30.5 | 55 |
| 9,000 | 29 | 319 | −39.0 | 39 | 29 | 324 | −33.6 | 25 | 28 | 318 | −40.2 | 36 | 24 | 288 | −52.2 | ---- | 26 | 314 | −39.6 | ---- | 9 | 296 | −47.0 | ---- | 26 | 317 | −32.0 | 61 |
| 10,000 | 28 | 275 | −46.2 | ---- | 29 | 281 | −41.0 | 24 | 28 | 275 | −47.7 | ---- | 24 | 247 | −53.9 | ---- | 26 | 270 | −46.0 | ---- | 9 | 254 | −51.4 | ---- | 23 | 274 | −44.8 | ---- |
| 11,000 | 27 | 236 | −52.1 | ---- | 28 | 242 | −47.7 | ---- | 28 | 235 | −53.5 | ---- | 24 | 212 | −53.1 | ---- | 25 | 232 | −51.6 | ---- | 6 | 216 | −52.8 | ---- | 19 | 235 | −50.8 | ---- |
| 12,000 | 27 | 202 | −56.9 | ---- | 28 | 208 | −53.9 | ---- | 28 | 201 | −57.3 | ---- | 23 | 181 | −52.1 | ---- | 24 | 198 | −55.9 | ---- | 6 | 185 | −53.5 | ---- | 18 | 202 | −55.0 | ---- |
| 13,000 | 26 | 172 | −59.9 | ---- | 27 | 177 | −59.5 | ---- | 28 | 172 | −59.7 | ---- | 22 | 154 | −51.7 | ---- | 21 | 169 | −58.1 | ---- | 6 | 158 | −53.5 | ---- | 17 | 172 | −58.6 | ---- |
| 14,000 | 24 | 146 | −62.1 | ---- | 27 | 151 | −64.0 | ---- | 28 | 146 | −61.6 | ---- | 21 | 133 | −51.8 | ---- | 21 | 144 | −59.5 | ---- | 5 | 134 | −54.2 | ---- | 16 | 147 | −61.4 | ---- |
| 15,000 | 23 | 124 | −62.4 | ---- | 26 | 127 | −68.1 | ---- | 28 | 124 | −63.2 | ---- | 18 | 114 | −52.3 | ---- | 19 | 123 | −60.5 | ---- | ---- | ---- | ---- | ---- | 12 | 124 | −63.7 | ---- |
| 16,000 | 19 | 106 | −63.8 | ---- | 24 | 108 | −70.9 | ---- | 27 | 106 | −63.7 | ---- | 12 | 97 | −52.6 | ---- | 17 | 105 | −60.9 | ---- | ---- | ---- | ---- | ---- | 11 | 105 | −64.7 | ---- |
| 17,000 | 17 | 90 | −63.8 | ---- | 23 | 91 | −71.1 | ---- | 26 | 90 | −63.3 | ---- | 6 | 83 | −53.0 | ---- | 16 | 89 | −60.5 | ---- | ---- | ---- | ---- | ---- | 5 | 88 | −65.0 | ---- |
| 18,000 | 12 | 76 | −62.9 | ---- | 23 | 77 | −68.8 | ---- | 20 | 76 | −62.2 | ---- | ---- | ---- | ---- | ---- | 15 | 76 | −59.3 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 19,000 | 6 | 64 | −61.5 | ---- | 16 | 66 | −65.4 | ---- | 6 | 65 | −61.3 | ---- | ---- | ---- | ---- | ---- | 8 | 65 | −57.5 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 20,000 | ---- | ---- | ---- | ---- | 10 | 56 | −62.6 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 21,000 | ---- | ---- | ---- | ---- | 6 | 47 | −59.7 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in °C., and relative humidities (R. H.) in percent obtained by radiosonde during October 1939*—Continued

| Altitude (meters) m. s. l. | Stations and elevations in meters above sea level | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Medford, Oreg. (401 m.) | | | | Miami, Fla. (4 m.) | | | | Minneapolis, Minn. (263 m.) | | | | Nashville, Tenn. (180 m.) | | | | Oakland, Calif. (2 m.) | | | | Oklahoma City, Okla. (391 m.) | | | | Omaha, Nebr. (300 m.) | | | |
| | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. |
| Surface | 31 | 972 | 8.8 | 85 | 30 | 1,014 | 23.0 | 92 | 31 | 982 | 6.7 | 71 | 30 | 997 | 13.9 | 75 | 31 | 1,017 | 12.2 | 83 | 30 | 971 | 14.4 | 64 | 31 | 980 | 9.7 | 65 |
| 500 | 31 | 960 | 10.1 | 80 | 30 | 958 | 22.7 | 81 | 31 | 954 | 6.9 | 70 | 30 | 960 | 15.2 | 68 | 31 | 959 | 16.0 | 64 | 30 | 958 | 16.3 | 59 | 31 | 957 | 11.3 | 59 |
| 1,000 | 31 | 904 | 11.7 | 68 | 30 | 905 | 19.6 | 80 | 31 | 898 | 6.0 | 67 | 30 | 905 | 12.6 | 68 | 31 | 904 | 15.1 | 54 | 30 | 904 | 16.8 | 52 | 31 | 901 | 11.6 | 51 |
| 1,500 | 31 | 852 | 10.1 | 62 | 30 | 854 | 17.0 | 76 | 31 | 845 | 4.3 | 66 | 30 | 853 | 10.8 | 62 | 31 | 852 | 12.7 | 49 | 30 | 852 | 14.5 | 47 | 31 | 849 | 10.1 | 49 |
| 2,000 | 31 | 802 | 7.8 | 56 | 30 | 805 | 14.6 | 69 | 31 | 795 | 2.7 | 62 | 30 | 803 | 8.8 | 57 | 31 | 802 | 10.1 | 43 | 30 | 803 | 11.7 | 46 | 31 | 799 | 7.8 | 51 |
| 2,500 | 31 | 754 | 5.3 | 52 | 30 | 758 | 12.3 | 62 | 31 | 747 | −0.2 | 60 | 30 | 756 | 6.3 | 51 | 31 | 756 | 7.5 | 39 | 30 | 756 | 8.4 | 47 | 31 | 752 | 4.8 | 50 |
| 3,000 | 31 | 709 | 2.4 | 48 | 30 | 714 | 10.0 | 57 | 31 | 701 | −3.0 | 60 | 30 | 711 | 3.6 | 48 | 31 | 710 | 4.8 | 36 | 30 | 711 | 4.9 | 47 | 31 | 707 | 2.0 | 49 |
| 4,000 | 31 | 626 | −3.3 | 43 | 30 | 633 | 4.6 | 51 | 31 | 617 | −8.4 | 56 | 30 | 628 | −1.9 | 44 | 30 | 628 | −1.5 | 33 | 29 | 629 | −1.1 | 42 | 31 | 624 | −4.7 | 48 |
| 5,000 | 31 | 551 | −9.1 | 40 | 29 | 559 | −1.2 | 46 | 30 | 542 | −14.6 | 52 | 30 | 553 | −7.6 | 36 | 30 | 553 | −7.7 | 32 | 29 | 554 | −6.8 | 38 | 31 | 548 | −10.5 | 44 |
| 6,000 | 30 | 483 | −16.5 | 38 | 29 | 493 | −7.3 | 45 | 30 | 474 | −21.2 | 49 | 30 | 486 | −14.0 | 34 | 29 | 486 | −15.1 | 31 | 29 | 486 | −13.4 | 35 | 31 | 481 | −17.5 | 41 |
| 7,000 | 30 | 422 | −24.0 | 37 | 29 | 433 | −13.6 | 44 | 28 | 413 | −28.7 | 47 | 30 | 425 | −21.2 | 33 | 29 | 425 | −22.9 | 30 | 29 | 426 | −20.1 | 34 | 31 | 420 | −24.6 | 39 |
| 8,000 | 29 | 367 | −32.1 | 35 | 29 | 379 | −20.1 | 44 | 27 | 359 | −36.2 | 43 | 29 | 371 | −28.3 | 33 | 27 | 370 | −31.1 | 30 | 28 | 372 | −27.0 | 32 | 31 | 366 | −32.0 | 38 |
| 9,000 | 29 | 318 | −39.7 | 35 | 28 | 330 | −27.4 | 41 | 27 | 310 | −42.8 | ---- | 28 | 322 | −35.6 | 32 | 27 | 320 | −38.9 | 29 | 28 | 323 | −34.4 | 31 | 31 | 316 | −39.8 | 37 |
| 10,000 | 29 | 274 | −46.4 | ---- | 28 | 287 | −35.2 | 41 | 25 | 267 | −48.3 | ---- | 26 | 278 | −42.5 | 31 | 27 | 277 | −46.1 | ---- | 28 | 280 | −42.0 | 29 | 30 | 273 | −46.8 | ---- |
| 11,000 | 29 | 235 | −52.5 | ---- | 28 | 248 | −43.2 | ---- | 22 | 229 | −52.9 | ---- | 26 | 239 | −49.0 | ---- | 27 | 238 | −52.5 | ---- | 29 | 240 | −48.6 | ---- | 30 | 234 | −52.2 | ---- |
| 12,000 | 28 | 201 | −56.9 | ---- | 28 | 213 | −50.4 | ---- | 20 | 196 | −55.6 | ---- | 26 | 205 | −54.4 | ---- | 26 | 203 | −57.4 | ---- | 29 | 206 | −54.3 | ---- | 30 | 200 | −56.5 | ---- |
| 13,000 | 28 | 172 | −60.2 | ---- | 28 | 182 | −56.6 | ---- | 19 | 167 | −56.6 | ---- | 26 | 175 | −59.0 | ---- | 26 | 173 | −60.4 | ---- | 29 | 176 | −58.7 | ---- | 30 | 171 | −59.1 | ---- |
| 14,000 | 28 | 146 | −62.4 | ---- | 28 | 156 | −62.7 | ---- | 19 | 143 | −56.9 | ---- | 25 | 149 | −62.7 | ---- | 26 | 147 | −62.7 | ---- | 28 | 150 | −62.8 | ---- | 30 | 146 | −61.4 | ---- |
| 15,000 | 27 | 124 | −63.2 | ---- | 28 | 132 | −67.8 | ---- | 18 | 122 | −57.4 | ---- | 23 | 127 | −65.7 | ---- | 25 | 125 | −65.0 | ---- | 28 | 128 | −66.2 | ---- | 29 | 124 | −62.4 | ---- |
| 16,000 | 25 | 105 | −63.6 | ---- | 28 | 112 | −70.8 | ---- | 17 | 104 | −58.0 | ---- | 22 | 108 | −67.2 | ---- | 23 | 106 | −66.1 | ---- | 26 | 108 | −68.3 | ---- | 29 | 105 | −63.1 | ---- |
| 17,000 | 20 | 89 | −62.9 | ---- | 28 | 94 | −71.3 | ---- | 17 | 89 | −57.7 | ---- | 19 | 91 | −67.7 | ---- | 22 | 90 | −65.6 | ---- | 25 | 92 | −68.0 | ---- | 26 | 90 | −62.9 | ---- |
| 18,000 | 17 | 76 | −62.1 | ---- | 28 | 79 | −71.0 | ---- | 14 | 76 | −57.0 | ---- | 18 | 77 | −65.5 | ---- | 20 | 76 | −64.4 | ---- | 20 | 78 | −66.8 | ---- | 22 | 76 | −61.1 | ---- |
| 19,000 | 12 | 64 | −60.7 | ---- | 24 | 67 | −68.8 | ---- | 10 | 64 | −56.3 | ---- | 16 | 65 | −62.3 | ---- | 17 | 64 | −62.6 | ---- | 17 | 66 | −64.6 | ---- | 15 | 65 | −59.4 | ---- |
| 20,000 | 6 | 54 | −58.9 | ---- | 20 | 57 | −65.9 | ---- | ---- | ---- | ---- | ---- | 12 | 55 | −59.5 | ---- | 10 | 55 | −61.0 | ---- | 15 | 56 | −62.1 | ---- | 12 | 55 | −58.0 | ---- |
| 21,000 | ---- | ---- | ---- | ---- | 15 | 48 | −63.2 | ---- | ---- | ---- | ---- | ---- | 6 | 46 | −56.3 | ---- | ---- | ---- | ---- | ---- | 6 | 48 | −59.7 | ---- | 7 | 47 | −56.6 | ---- |
| 22,000 | ---- | ---- | ---- | ---- | 11 | 41 | −60.7 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 23,000 | ---- | ---- | ---- | ---- | 5 | 34 | −58.8 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |

| Altitude (meters) m. s. l. | Stations and elevations in meters above sea level | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phoenix, Ariz. (339 m.) | | | | St. Louis, Mo. (176 m.) | | | | San Juan, P. R. (18 m.) | | | | Sault Ste. Marie, Mich. (221 m.) | | | | Spokane, Wash. (597 m.) | | | | Swan Island, W. I. (10 m.) | | | | Washington, D. C.[1] (7 m.) | | | |
| | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. |
| Surface | 31 | 974 | 15.7 | 52 | 30 | 997 | 12.4 | 71 | 29 | 1,009 | 25.1 | 87 | 31 | 987 | 4.2 | 87 | 31 | 948 | 6.7 | 80 | 31 | 1,009 | 26.7 | 84 | 30 | 1,018 | 11.4 | 86 |
| 500 | 31 | 956 | 21.0 | 45 | 30 | 960 | 14.3 | 56 | 29 | 956 | 23.0 | 85 | 31 | 954 | 4.4 | 85 | ---- | ---- | ---- | ---- | 31 | 955 | 23.2 | 87 | 30 | 960 | 12.7 | 68 |
| 1,000 | 31 | 902 | 20.2 | 37 | 30 | 904 | 12.6 | 51 | 29 | 903 | 20.0 | 82 | 31 | 897 | 2.9 | 82 | 31 | 903 | 8.0 | 71 | 31 | 902 | 19.7 | 84 | 30 | 904 | 10.9 | 61 |
| 1,500 | 31 | 851 | 16.8 | 36 | 30 | 852 | 10.3 | 51 | 29 | 852 | 17.4 | 80 | 31 | 843 | 0.4 | 82 | 31 | 850 | 5.8 | 68 | 31 | 851 | 16.6 | 80 | 30 | 852 | 9.0 | 57 |
| 2,000 | 31 | 802 | 13.2 | 36 | 30 | 802 | 7.9 | 49 | 29 | 803 | 14.8 | 75 | 31 | 792 | −1.8 | 79 | 31 | 798 | 2.7 | 69 | 31 | 802 | 13.8 | 75 | 30 | 802 | 7.1 | 56 |
| 2,500 | 31 | 756 | 10.0 | 36 | 30 | 755 | 5.0 | 45 | 29 | 757 | 12.2 | 71 | 31 | 743 | −3.7 | 72 | 31 | 750 | −0.3 | 69 | 31 | 756 | 11.0 | 69 | 30 | 754 | 5.0 | 53 |
| 3,000 | 31 | 712 | 6.8 | 36 | 30 | 709 | 2.2 | 42 | 29 | 713 | 9.8 | 67 | 31 | 697 | −5.6 | 67 | 31 | 705 | −2.7 | 66 | 31 | 711 | 8.3 | 64 | 29 | 709 | 2.5 | 52 |
| 4,000 | 31 | 629 | 0.2 | 35 | 30 | 626 | −3.8 | 38 | 29 | 631 | 4.6 | 62 | 30 | 613 | −11.4 | 64 | 30 | 621 | −7.8 | 54 | 31 | 630 | 2.9 | 56 | 29 | 626 | −2.1 | 46 |
| 5,000 | 31 | 555 | −6.4 | 32 | 30 | 551 | −9.9 | 34 | 29 | 558 | −1.3 | 60 | 30 | 538 | −18.0 | 63 | 30 | 545 | −13.4 | 50 | 31 | 556 | −2.1 | 49 | 29 | 551 | −7.9 | 45 |
| 6,000 | 31 | 487 | −13.6 | 30 | 30 | 483 | −16.5 | 33 | 28 | 491 | −6.9 | 57 | 30 | 470 | −24.1 | 62 | 30 | 477 | −19.9 | 48 | 30 | 490 | −7.4 | 45 | 29 | 484 | −13.8 | 38 |
| 7,000 | 31 | 427 | −21.2 | 29 | 30 | 422 | −23.9 | 30 | 28 | 432 | −13.0 | 52 | 30 | 408 | −31.7 | 61 | 30 | 416 | −27.2 | 49 | 30 | 430 | −13.6 | 42 | 28 | 424 | −20.7 | 38 |
| 8,000 | 30 | 372 | −28.6 | 28 | 30 | 368 | −31.6 | 29 | 28 | 378 | −19.5 | 51 | 30 | 354 | −38.5 | 59 | 30 | 361 | −35.0 | 49 | 30 | 376 | −20.2 | 42 | 21 | 370 | −28.1 | 40 |
| 9,000 | 30 | 322 | −35.7 | 28 | 30 | 318 | −38.7 | 29 | 28 | 329 | −26.6 | 48 | 29 | 305 | −44.5 | ---- | 30 | 312 | −42.6 | 50 | 30 | 328 | −27.3 | 41 | 20 | 321 | −35.6 | 39 |
| 10,000 | 30 | 279 | −42.3 | 27 | 29 | 275 | −45.5 | ---- | 28 | 286 | −34.3 | 47 | 25 | 263 | −49.4 | ---- | 29 | 268 | −49.8 | ---- | 30 | 285 | −34.6 | 40 | 19 | 277 | −43.1 | ---- |
| 11,000 | 30 | 240 | −48.3 | ---- | 29 | 236 | −51.6 | ---- | 28 | 248 | −42.0 | ---- | 25 | 225 | −52.8 | ---- | 29 | 230 | −55.6 | ---- | 30 | 246 | −42.2 | ---- | 18 | 238 | −49.9 | ---- |
| 12,000 | 29 | 206 | −53.3 | ---- | 29 | 202 | −56.5 | ---- | 28 | 214 | −49.5 | ---- | 25 | 193 | −54.8 | ---- | 28 | 196 | −58.4 | ---- | 30 | 212 | −49.9 | ---- | 17 | 204 | −55.8 | ---- |
| 13,000 | 28 | 176 | −57.3 | ---- | 28 | 172 | −59.8 | ---- | 28 | 183 | −56.6 | ---- | 23 | 165 | −56.0 | ---- | 27 | 167 | −59.4 | ---- | 30 | 182 | −57.4 | ---- | 11 | 174 | −59.8 | ---- |
| 14,000 | 28 | 150 | −61.0 | ---- | 26 | 146 | −62.7 | ---- | 28 | 156 | −63.2 | ---- | 21 | 141 | −56.2 | ---- | 27 | 142 | −60.1 | ---- | 30 | 155 | −64.4 | ---- | 8 | 148 | −62.8 | ---- |
| 15,000 | 25 | 127 | −63.9 | ---- | 25 | 124 | −64.4 | ---- | 28 | 132 | −69.2 | ---- | 20 | 121 | −57.4 | ---- | 26 | 121 | −60.7 | ---- | 30 | 131 | −70.8 | ---- | 5 | 126 | −63.8 | ---- |
| 16,000 | 25 | 108 | −66.4 | ---- | 25 | 106 | −64.9 | ---- | 28 | 112 | −73.6 | ---- | 19 | 103 | −58.2 | ---- | 25 | 103 | −60.5 | ---- | 29 | 110 | −75.7 | ---- | ---- | ---- | ---- | ---- |
| 17,000 | 25 | 92 | −67.1 | ---- | 20 | 90 | −63.7 | ---- | 28 | 94 | −76.0 | ---- | 16 | 88 | −58.2 | ---- | 20 | 87 | −60.2 | ---- | 27 | 93 | −78.7 | ---- | ---- | ---- | ---- | ---- |
| 18,000 | 21 | 77 | −65.6 | ---- | 14 | 76 | −61.8 | ---- | 27 | 79 | −75.4 | ---- | 6 | 75 | −59.0 | ---- | 14 | 75 | −59.2 | ---- | 27 | 78 | −78.7 | ---- | ---- | ---- | ---- | ---- |
| 19,000 | 18 | 66 | −63.9 | ---- | 8 | 64 | −58.4 | ---- | 25 | 67 | −73.4 | ---- | ---- | ---- | ---- | ---- | 7 | 63 | −58.6 | ---- | 19 | 65 | −76.7 | ---- | ---- | ---- | ---- | ---- |
| 20,000 | 15 | 56 | −61.5 | ---- | ---- | ---- | ---- | ---- | 18 | 56 | −70.4 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 15 | 55 | −74.1 | ---- | ---- | ---- | ---- | ---- |
| 21,000 | 9 | 48 | −59.6 | ---- | ---- | ---- | ---- | ---- | 16 | 48 | −67.3 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 10 | 46 | −72.6 | ---- | ---- | ---- | ---- | ---- |
| 22,000 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 11 | 40 | −64.5 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 7 | 39 | −70.4 | ---- | ---- | ---- | ---- | ---- |

Observations taken about 4 a. m., 75th meridian time.

[1] Navy.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels; also, the humidity data are not used in daily observations when the temperature is below −40.0° C.

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in °C., and relative humidities (R. H.) in percent obtained by radiosonde during October 1939*—Continued

**LATE REPORT FOR SEPTEMBER 1939**

| Altitude (meters) m. s. l. | Boise, Idaho (824 m.) | | | | Altitude (meters) m. s. l. | Boise, Idaho (824 m.) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number of observations | Pressure | Temperature | Relative humidity | | Number of observations | Pressure | Temperature | Relative humidity |
| Surface | 30 | 920 | 12.7 | 71 | 10,000 | 27 | 278 | −43.5 | 42 |
| 500 | | | | | 11,000 | 27 | 239 | −49.8 | 41 |
| 1,000 | 30 | 902 | 17.4 | 53 | 12,000 | 27 | 205 | −53.9 | |
| 1,500 | 30 | 850 | 16.1 | 44 | 13,000 | 25 | 175 | −56.3 | |
| 2,000 | 30 | 801 | 13.0 | 43 | 14,000 | 25 | 149 | −58.5 | |
| 2,500 | 30 | 754 | 9.7 | 44 | 15,000 | 24 | 127 | −60.9 | |
| 3,000 | 30 | 710 | 6.2 | 47 | 16,000 | 24 | 108 | −61.7 | |
| 4,000 | 29 | 628 | −1.0 | 51 | 17,000 | 24 | 92 | −61.7 | |
| 5,000 | 29 | 553 | −7.6 | 50 | 18,000 | 20 | 78 | −61.4 | |
| 6,000 | 27 | 486 | −14.1 | 48 | 19,000 | 16 | 66 | −60.6 | |
| 7,000 | 27 | 425 | −21.0 | 44 | 20,000 | 10 | 56 | −59.5 | |
| 8,000 | 27 | 371 | −28.7 | 44 | 21,000 | 5 | 47 | −58.3 | |
| 9,000 | 27 | 321 | −36.3 | 43 | | | | | |

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (E. S. T.) during October 1939*

[Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°).—Velocities in meters per second (superior figures indicate number of observations)]

| Altitude (meters) m. s. l. | Abilene, Tex. (537 m.) | | Albuquerque, N. Mex. (1,554 m.) | | Atlanta, Ga. (302 m.) | | Billings, Mont. (1,095 m.) | | Boise, Idaho (850 m.) | | Brooklyn, N. Y. (15 m.) | | Brownsville, Tex. (7 m.) | | Buffalo, N. Y. (220 m.) | | Burlington, Vt. (132 m.) | | Charleston, S. C. (18 m.) | | Cheyenne, Wyo. (1,873 m.) | | Chicago, Ill. (192 m.) | | Cincinnati, Ohio (157 m.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | $195^{31}$ | 2.5 | $244^{31}$ | 2.4 | $294^{31}$ | 1.6 | $281^{30}$ | 3.6 | $292^{31}$ | 2.4 | $285^{37}$ | 2.7 | $109^{31}$ | 2.6 | $259^{31}$ | 3.4 | $231^{30}$ | 1.3 | $25^{30}$ | 0.3 | $268^{31}$ | 4.2 | $248^{31}$ | 3.2 | $226^{31}$ | 2.3 |
| 500 | | | | | $316^{31}$ | 1.8 | $286^{30}$ | 5.2 | | | $279^{37}$ | 5.0 | $98^{31}$ | 2.8 | $248^{31}$ | 6.0 | $217^{30}$ | 4.2 | $333^{30}$ | 0.6 | | | $245^{31}$ | 4.9 | $240^{31}$ | 4.0 |
| 1,000 | $202^{31}$ | 3.5 | | | $316^{30}$ | 1.8 | $278^{37}$ | 7.4 | $297^{31}$ | 2.6 | $270^{36}$ | 6.0 | $99^{24}$ | 2.4 | $241^{37}$ | 9.4 | $252^{37}$ | 6.5 | $304^{28}$ | 1.6 | | | $245^{30}$ | 7.1 | $243^{29}$ | 4.7 |
| 1,500 | $198^{31}$ | 3.3 | | | $285^{30}$ | 2.0 | $278^{37}$ | 8.8 | $324^{31}$ | 2.7 | $280^{38}$ | 7.8 | $130^{31}$ | 1.5 | $250^{37}$ | 11.2 | $258^{36}$ | 9.0 | $306^{33}$ | 3.2 | | | $250^{37}$ | 8.6 | $252^{37}$ | 6.7 |
| 2,000 | $207^{30}$ | 3.2 | $228^{31}$ | 3.8 | $287^{30}$ | 3.0 | $287^{38}$ | 10.6 | $310^{36}$ | 3.0 | $281^{31}$ | 9.2 | $358^{18}$ | .8 | $261^{31}$ | 12.6 | $280^{17}$ | 9.1 | $207^{32}$ | 4.0 | $265^{31}$ | 4.4 | $264^{33}$ | 11.0 | $265^{37}$ | 8.5 |
| 2,500 | $237^{26}$ | 3.4 | $238^{31}$ | 3.5 | $285^{37}$ | 4.6 | $293^{36}$ | 13.8 | $285^{37}$ | 4.2 | $285^{39}$ | 11.6 | $302^{24}$ | 1.3 | $265^{18}$ | 13.6 | $281^{16}$ | 10.5 | $290^{32}$ | 5.1 | $277^{31}$ | 5.2 | $263^{30}$ | 13.8 | $270^{36}$ | 8.8 |
| 3,000 | $260^{36}$ | 4.0 | $258^{31}$ | 3.7 | $293^{36}$ | 6.0 | $304^{10}$ | 15.2 | $286^{37}$ | 5.4 | $285^{10}$ | 13.4 | $280^{13}$ | 1.8 | | | | | $283^{31}$ | 6.7 | $282^{31}$ | 6.3 | $266^{31}$ | 14.3 | $276^{34}$ | 11.5 |
| 4,000 | $262^{36}$ | 6.2 | $270^{31}$ | 5.5 | $287^{34}$ | 7.6 | $311^{17}$ | 18.1 | $289^{22}$ | 6.9 | $282^{10}$ | 15.2 | $263^{10}$ | 1.4 | | | | | $273^{18}$ | 7.0 | $284^{28}$ | 9.0 | $294^{11}$ | 13.9 | $276^{10}$ | 12.2 |
| 5,000 | $266^{34}$ | 7.1 | $264^{27}$ | 8.0 | $278^{32}$ | 10.2 | $314^{16}$ | 19.2 | $286^{13}$ | 10.2 | $272^{13}$ | 14.0 | | | | | | | $283^{16}$ | 8.1 | $281^{33}$ | 12.4 | | | $267^{16}$ | 11.9 |
| 6,000 | $262^{33}$ | 9.0 | $272^{28}$ | 10.3 | $279^{22}$ | 11.9 | | | | | | | | | | | | | $291^{13}$ | 10.4 | $275^{33}$ | 13.4 | | | $266^{13}$ | 11.2 |
| 8,000 | $263^{31}$ | 16.7 | $264^{30}$ | 11.6 | $276^{31}$ | 16.4 | | | | | | | | | | | | | | | $276^{23}$ | 15.5 | | | | |
| 10,000 | $268^{16}$ | 20.3 | $264^{16}$ | 16.2 | $278^{16}$ | 22.1 | | | | | | | | | | | | | | | $295^{16}$ | 21.2 | | | | |
| 12,000 | $273^{16}$ | 20.6 | $263^{13}$ | 23.5 | $280^{10}$ | 19.9 | | | | | | | | | | | | | | | | | | | | |
| 14,000 | $261^{11}$ | 25.1 | | | | | | | | | | | | | | | | | | | | | | | | |

| Altitude (meters) m. s. l. | El Paso, Tex. (1,196 m.) | | Fargo, N. Dak. (283 m.) | | Greensboro, N. C. (271 m.) | | Havre, Mont. (766 m.) | | Houston, Tex. (21 m.) | | Huron, S. Dak. (393 m.) | | Las Vegas, Nev. (570 m.) | | Little Rock, Ark. (82 m.) | | Medford, Oreg. (410 m.) | | Miami, Fla. (10 m.) | | Minneapolis, Minn. (261 m.) | | Nashville, Tenn. (194 m.) | | New Orleans, La. (19 m.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | $208^{31}$ | 0.9 | $282^{28}$ | 2.1 | $263^{29}$ | 0.9 | $277^{36}$ | 2.9 | $116^{31}$ | 2.2 | $285^{31}$ | 2.1 | $78^{31}$ | 1.4 | $187^{31}$ | 1.2 | $323^{28}$ | 0.5 | $65^{31}$ | 4.0 | $258^{30}$ | 2.4 | $256^{30}$ | 2.2 | $21^{30}$ | 2.2 |
| 500 | | | $280^{28}$ | 2.2 | $277^{29}$ | 1.9 | | | $136^{30}$ | 2.4 | $290^{31}$ | 2.4 | | | $213^{31}$ | 2.6 | $339^{28}$ | .5 | $69^{31}$ | 4.7 | $256^{30}$ | 2.6 | $254^{30}$ | 3.0 | $60^{30}$ | 3.1 |
| 1,000 | | | $251^{24}$ | 3.5 | $273^{29}$ | 3.4 | $267^{36}$ | 5.6 | $135^{30}$ | 1.7 | $286^{31}$ | 3.7 | $85^{31}$ | 1.3 | $246^{31}$ | 3.2 | $31^{28}$ | .5 | $66^{31}$ | 4.0 | $244^{27}$ | 4.5 | $254^{30}$ | 3.2 | $52^{30}$ | 2.9 |
| 1,500 | $213^{31}$ | 1.3 | $279^{23}$ | 6.1 | $283^{28}$ | 3.6 | $262^{36}$ | 9.0 | $29^{30}$ | .6 | $278^{29}$ | 5.9 | $261^{31}$ | .4 | $266^{30}$ | 3.5 | $194^{28}$ | .5 | $71^{31}$ | 2.8 | $259^{28}$ | 7.2 | $264^{29}$ | 3.9 | $45^{29}$ | 2.3 |
| 2,000 | $210^{31}$ | 1.8 | $285^{20}$ | 9.2 | $283^{26}$ | 6.3 | $270^{35}$ | 11.2 | $319^{30}$ | 1.1 | $282^{27}$ | 9.5 | $246^{31}$ | 1.9 | $271^{29}$ | 4.0 | $222^{27}$ | 1.3 | $85^{30}$ | 2.2 | $267^{23}$ | 8.9 | $273^{27}$ | 4.9 | $356^{23}$ | 2.2 |
| 2,500 | $211^{31}$ | 2.7 | $284^{19}$ | 10.7 | $282^{26}$ | 7.7 | $274^{33}$ | 12.8 | $262^{28}$ | 1.0 | $285^{27}$ | 11.0 | $252^{31}$ | 2.4 | $272^{29}$ | 5.8 | $279^{26}$ | 1.8 | $103^{27}$ | 2.0 | $276^{20}$ | 12.7 | $283^{26}$ | 5.8 | $315^{24}$ | 2.3 |
| 3,000 | $229^{31}$ | 3.5 | $279^{15}$ | 12.6 | $285^{24}$ | 8.8 | $279^{34}$ | 13.3 | $263^{27}$ | 2.8 | $289^{27}$ | 12.9 | $263^{31}$ | 2.5 | $266^{29}$ | 6.3 | $307^{23}$ | 3.0 | $124^{27}$ | 1.5 | $277^{16}$ | 13.5 | $294^{29}$ | 7.9 | $302^{23}$ | 3.1 |
| 4,000 | $255^{27}$ | 5.4 | $277^{13}$ | 16.5 | $277^{23}$ | 12.5 | $284^{17}$ | 12.9 | $253^{25}$ | 5.2 | $283^{31}$ | 16.0 | $270^{31}$ | 3.7 | $273^{25}$ | 6.4 | $301^{21}$ | 4.0 | $132^{26}$ | 2.0 | $269^{10}$ | 15.5 | $293^{17}$ | 11.9 | $262^{10}$ | 3.6 |
| 5,000 | $251^{26}$ | 6.9 | $274^{13}$ | 19.2 | $278^{21}$ | 14.7 | $293^{10}$ | 13.9 | $251^{26}$ | 7.6 | $285^{17}$ | 18.7 | $255^{31}$ | 4.3 | $276^{23}$ | 9.4 | $289^{19}$ | 5.8 | $169^{22}$ | 1.2 | | | $291^{14}$ | 11.9 | $266^{17}$ | 5.9 |
| 6,000 | $270^{21}$ | 6.8 | $282^{21}$ | 21.9 | $284^{15}$ | 12.8 | | | $253^{23}$ | 9.8 | $282^{14}$ | 17.6 | $268^{31}$ | 5.5 | $271^{23}$ | 10.7 | $282^{18}$ | 6.5 | $247^{17}$ | 1.1 | | | $291^{11}$ | 12.9 | $266^{13}$ | 7.8 |
| 8,000 | $279^{16}$ | 9.3 | | | $281^{11}$ | 16.7 | | | $253^{19}$ | 15.3 | $276^{13}$ | 19.2 | $281^{29}$ | 7.7 | $269^{14}$ | 12.1 | $291^{16}$ | 10.0 | $305^{13}$ | 6.1 | | | | | | |
| 10,000 | | | | | | | | | $261^{16}$ | 23.2 | | | $292^{26}$ | 8.1 | $261^{10}$ | 16.6 | $289^{13}$ | 12.9 | | | | | | | | |
| 12,000 | | | | | | | | | $262^{21}$ | 26.6 | | | $278^{23}$ | 9.7 | | | | | | | | | | | | |
| 14,000 | | | | | | | | | | | | | $273^{21}$ | 9.6 | | | | | | | | | | | | |
| 16,000 | | | | | | | | | | | | | $277^{19}$ | 8.3 | | | | | | | | | | | | |
| 18,000 | | | | | | | | | | | | | $264^{15}$ | 6.1 | | | | | | | | | | | | |

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (E. S. T.) during October 1939*—Continued.

| Altitude (meters) m. s. l. | Oakland, Calif. (8 m.) | | Oklahoma City, Okla. (402 m.) | | Omaha, Nebr. (306 m.) | | Reno, Nev. (1,346 m.) | | St. Louis, Mo. (170 m.) | | Salt Lake City, Utah (1,294 m.) | | San Diego, Calif. (15 m.) | | San Juan, P. R. (16 m.) | | Sault Ste. Marie, Mich. (198 m.) | | Seattle, Wash. (14 m.) | | Spokane, Wash. (603 m.) | | Washington, D. C. (10 m.) | | Winslow, Ariz. (1,488 m.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | 262[31] | 3.7 | 199[31] | 3.9 | 247[31] | 2.0 | 287[31] | 0.9 | 234[31] | 2.8 | 267[31] | 1.2 | 287[31] | 3.8 | 75[31] | 3.8 | 276[31] | 1.9 | 243[29] | 2.0 | 220[31] | 2.5 | 282[28] | 1.8 | 234[31] | 3.0 |
| 500 | 318[31] | 2.3 | 200[31] | 4.0 | 245[31] | 2.5 | ------ | --- | 249[31] | 4.3 | ------ | ------ | 286[31] | 2.3 | 90[31] | 3.9 | 277[31] | 3.3 | 223[29] | 2.4 | ------ | ------ | 282[28] | 3.6 | ------ | ------ |
| 1,000 | 338[31] | 1.5 | 212[31] | 4.3 | 227[29] | 4.3 | ------ | ------ | 232[28] | 6.0 | ------ | ------ | 112[30] | .4 | 100[28] | 3.9 | 259[22] | 6.3 | 218[22] | 1.5 | 213[31] | 3.9 | 268[24] | 5.9 | ------ | ------ |
| 1,500 | 312[28] | 1.8 | 232[30] | 4.6 | 249[24] | 6.2 | 317[31] | .7 | 248[23] | 8.0 | 251[31] | 1.4 | 99[28] | 2.2 | 102[27] | 3.7 | 257[17] | 9.9 | 254[19] | 2.0 | 228[30] | 5.0 | 280[24] | 8.9 | ------ | ------ |
| 2,000 | 329[28] | 2.1 | 248[28] | 4.7 | 256[27] | 9.0 | 220[31] | .3 | 264[23] | 9.5 | 255[31] | 2.2 | 98[28] | 2.1 | 98[26] | 2.9 | 254[13] | 13.7 | 281[17] | 3.5 | 246[25] | 6.1 | 277[24] | 10.9 | 229[31] | 2.4 |
| 2,500 | 333[28] | 2.1 | 253[27] | 6.0 | 268[26] | 11.1 | 206[30] | .9 | 274[27] | 11.0 | 230[30] | 2.7 | 78[24] | 2.6 | 102[26] | 2.9 | 264[12] | 16.3 | 282[15] | 4.1 | 265[22] | 7.1 | 274[22] | 11.0 | 222[31] | 2.5 |
| 3,000 | 328[29] | 2.6 | 262[27] | 6.8 | 273[26] | 12.8 | 238[23] | .4 | 277[24] | 11.5 | 253[28] | 2.9 | 58[21] | 1.2 | 94[23] | 2.6 | 265[10] | 16.5 | 258[13] | 6.2 | 286[20] | 7.3 | 276[19] | 10.8 | 228[31] | 3.0 |
| 4,000 | 330[28] | 3.6 | 270[25] | 8.3 | 277[26] | 14.7 | 306[21] | 2.6 | 280[11] | 14.1 | 287[23] | 5.5 | 29[20] | 1.5 | 62[20] | 1.2 | ------ | ------ | 287[19] | 7.3 | 289[14] | 10.3 | 266[13] | 13.3 | 243[29] | 4.9 |
| 5,000 | 300[23] | 2.3 | 271[24] | 9.5 | 283[24] | 15.2 | 296[26] | 4.9 | ------ | ------ | 288[23] | 9.1 | 289[19] | 2.5 | 12[16] | 1.4 | ------ | ------ | ------ | ------ | 297[11] | 12.9 | ------ | ------ | 257[27] | 5.6 |
| 6,000 | 305[19] | 2.3 | 281[23] | 10.7 | 292[22] | 18.2 | 294[23] | 6.0 | ------ | ------ | 295[20] | 10.9 | 316[16] | 3.4 | 32[13] | 2.8 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 261[26] | 6.0 |
| 8,000 | 289[11] | 2.7 | 274[16] | 11.8 | 299[19] | 20.8 | 310[26] | 7.4 | ------ | ------ | 297[19] | 10.3 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 257[24] | 8.3 |
| 10,000 | ------ | ------ | 258[13] | 18.9 | 296[12] | 19.5 | 295[18] | 6.7 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 281[21] | 8.3 |
| 12,000 | ------ | ------ | 262[10] | 21.5 | 282[13] | 25.7 | 303[18] | 5.5 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 262[19] | 14.4 |
| 14,000 | ------ | ------ | ------ | ------ | 281[13] | 25.1 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 265[15] | 12.0 |
| 16,000 | ------ | ------ | ------ | ------ | 266[11] | 19.1 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 278[10] | 11.8 |

TABLE 3.—*Maximum free-air wind velocities (M. P. S.), for different sections of the United States, based on pilot-balloon observations during October 1939*

| Section | Surface to 2,500 meters (m. s. l.) | | | | | Between 2,500 and 5,000 meters (m. s. l.) | | | | | Above 5,000 meters (m. s. l.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station |
| Northeast [1] | 35.5 | WSW | 1,570 | 19 | Buffalo, N. Y. | 62.8 | NW | 4,240 | 24 | Hartford, Conn | 46.4 | WNW | 5,420 | 17 | Harrisburg, Pa. |
| East-Central [2] | 33.7 | WNW | 1,360 | 28 | Washington, D. C. | 38.2 | WNW | 5,000 | 23 | Greensboro, N. C. | 53.5 | W | 9,900 | 18 | Greensboro, N. C. |
| Southeast [3] | 29.6 | NE | 430 | 15 | Jacksonville, Fla. | 38.8 | WSW | 4,420 | 30 | Mobile, Ala. | 68.0 | WSW | 7,050 | 17 | Atlanta, Ga. |
| North-Central [4] | 40.4 | WNW | 900 | 11 | Fargo, N. Dak. | 47.0 | NNW | 3,120 | 31 | Bismarck, N. Dak. | 55.9 | NNW | 8,850 | 20 | Fargo, N. Dak. |
| Central [5] | 39.2 | WSW | 2,070 | 5 | Moline, Ill. | 48.0 | NW | 5,000 | 22 | Indianapolis, Ind. | 77.5 | W | 13,360 | 25 | Omaha, Nebr. |
| South-Central [6] | 34.0 | SW | 2,470 | 24 | Amarillo, Tex. | 48.4 | SW | 4,990 | 26 | Amarillo, Tex. | 66.0 | WSW | 12,230 | 19 | Houston, Tex. |
| Northwest [7] | 42.0 | WNW | 2,300 | 21 | Havre, Mont. | 40.0 | SSW | 3,430 | 24 | Pocatello, Idaho | 62.6 | N | 8,260 | 29 | Billings, Mont. |
| West-Central [8] | 39.8 | S | 2,500 | 24 | Ely, Nev. | 45.1 | S | 2,710 | 24 | Ely, Nev. | 69.0 | SW | 12,400 | 25 | Cheyenne, Wyo. |
| Southwest [9] | 42.2 | SW | 2,140 | 24 | Las Vegas, Nev. | 37.1 | SW | 4,880 | 3 | Albuquerque, N. Mex. | 75.6 | WSW | 10,760 | 27 | Albuquerque, N. Mex. |

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during October 1939, classified according to the potential temperatures (10-degree intervals between 290° and 409° A.) with which they are identified. (Based on radiosonde observations)*

| Potential temperature | Albuquerque, N. Mex. | | | Atlanta, Ga. | | | Billings, Mont. | | | Bismarck, N. Dak. | | | Boise, Idaho | | | Buffalo, N. Y. | | | Charleston, S. C. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature |
| 290–299 | ------ | ------ | ------ | ------ | ------ | ------ | 2 | 6.4 | −36.5 | ------ | ------ | ------ | ------ | ------ | ------ | 1 | 6.9 | −45.0 | ------ | ------ | ------ |
| 300–309 | ------ | ------ | ------ | ------ | ------ | ------ | 2 | 8.7 | −53.0 | 1 | 6.8 | −40.0 | 2 | 6.4 | −30.0 | 2 | 7.6 | −44.5 | ------ | ------ | ------ |
| 310–319 | 1 | 7.6 | −32.0 | ------ | ------ | ------ | 7 | 8.9 | −47.7 | 10 | 8.9 | −48.4 | 9 | 8.7 | −44.6 | 7 | 9.1 | −50.1 | ------ | ------ | ------ |
| 320–329 | 6 | 9.4 | −43.0 | 6 | 8.5 | −33.7 | 25 | 10.4 | −54.2 | 18 | 10.2 | −52.8 | 30 | 10.2 | −52.0 | 15 | 10.0 | −52.4 | 3 | 9.1 | −41.3 |
| 330–339 | 16 | 11.0 | −52.6 | 12 | 12.0 | −55.4 | 23 | 11.7 | −60.6 | 13 | 12.0 | −60.0 | 24 | 11.4 | −58.3 | 15 | 11.8 | −60.3 | 15 | 11.3 | −53.1 |
| 340–349 | 12 | 12.5 | −60.2 | 12 | 12.4 | −57.8 | 6 | 12.2 | −59.5 | 6 | 12.4 | −60.8 | 9 | 12.4 | −60.1 | 6 | 12.5 | −62.7 | 12 | 12.3 | −56.8 |
| 350–359 | 4 | 13.5 | −63.8 | 8 | 13.5 | −63.0 | 2 | 13.1 | −62.0 | 3 | 12.9 | −61.3 | 4 | 13.3 | −64.0 | 7 | 13.3 | −63.0 | 9 | 13.6 | −63.0 |
| 360–369 | 6 | 14.1 | −63.7 | 11 | 15.0 | −70.4 | 2 | 13.6 | −63.5 | ------ | ------ | ------ | 5 | 13.4 | −60.6 | 4 | 14.2 | −65.8 | 5 | 14.6 | −66.2 |
| 370–379 | 4 | 14.8 | −64.8 | 8 | 15.7 | −73.0 | 2 | 13.7 | −57.5 | 1 | 13.7 | −58.0 | 4 | 14.8 | −65.5 | 2 | 15.6 | −71.5 | 6 | 15.9 | −72.8 |
| 380–389 | 1 | 15.1 | −64.0 | 8 | 15.9 | −70.6 | 5 | 15.1 | −63.0 | ------ | ------ | ------ | 7 | 15.3 | −66.0 | 3 | 14.9 | −62.7 | 4 | 15.9 | −69.0 |
| 390–399 | 6 | 16.3 | −69.0 | 4 | 16.4 | −70.0 | 2 | 16.0 | −66.5 | ------ | ------ | ------ | 3 | 15.9 | −66.0 | 1 | 16.0 | −68.0 | 1 | 16.3 | −70.0 |
| 400–409 | 3 | 16.5 | −67.7 | 5 | 17.1 | −72.0 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 2 | 16.8 | −69.5 | 2 | 16.8 | −69.0 |
| Weighted means | ------ | 12.7 | −58.2 | ------ | 13.8 | −62.5 | ------ | 11.3 | −56.8 | ------ | 10.8 | −55.0 | ------ | 11.5 | −56.1 | ------ | 11.7 | −58.4 | ------ | 13.1 | −60.0 |
| Mean potential temperature (weighted) | 352.1 | | | 359.5 | | | 335.4 | | | 324.0 | | | 339.1 | | | 340.1 | | | 352.8 | | |

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during October 1939, classified according to the potential temperatures (10-degree intervals between 290° and 409° A.) with which they are identified. Based on radiosonde observations)*—Con.

| Potential temperature | Denver, Colo. | | | El Paso, Tex. | | | Ely, Nev. | | | Joliet, Ill. | | | Lakehurst, N. J. | | | Medford, Oreg. | | | Miami, Fla. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature |
| 290–299 | | | | | | | | | | | | | | | | | | | | | |
| 300–309 | | | | | | | | | | 1 | 8.2 | −51.0 | | | | | | | | | |
| 310–319 | 2 | 9.2 | −47.0 | | | | 4 | 8.8 | −44.8 | 6 | 9.1 | −51.3 | 3 | 8.3 | −39.7 | 7 | 8.3 | −41.6 | | | |
| 320–329 | 22 | 9.7 | −45.5 | 6 | 9.6 | −44.0 | 24 | 10.0 | −48.7 | 10 | 10.2 | −51.0 | 10 | 9.7 | −46.2 | 18 | 10.0 | −48.8 | 1 | 11.0 | −53.0 |
| 330–339 | 20 | 11.6 | −87.9 | 14 | 11.0 | −50.9 | 23 | 11.4 | −56.5 | 13 | 11.4 | −58.2 | 10 | 10.5 | −48.5 | 28 | 11.3 | −55.5 | 5 | 11.3 | −51.4 |
| 340–349 | 10 | 12.3 | −58.8 | 13 | 12.3 | −57.2 | 12 | 12.5 | −60.6 | 9 | 12.2 | −59.4 | 6 | 12.4 | −58.8 | 9 | 12.4 | −60.4 | 15 | 11.7 | −48.9 |
| 350–359 | 8 | 13.2 | −61.2 | 13 | 13.6 | −63.8 | 6 | 13.3 | −62.3 | 3 | 13.1 | −61.7 | 2 | 14.0 | −67.5 | 11 | 13.5 | −64.3 | 12 | 13.4 | −60.6 |
| 360–369 | 8 | 14.1 | −64.6 | 13 | 14.9 | −69.9 | 4 | 14.6 | −66.5 | 3 | 13.9 | −62.3 | 2 | 14.0 | −63.0 | 7 | 14.2 | −65.4 | 17 | 14.8 | −68.0 |
| 370–379 | 2 | 14.8 | −64.0 | 6 | 15.4 | −70.7 | 5 | 14.7 | −65.0 | 8 | 14.4 | −61.6 | 3 | 14.6 | −64.3 | 4 | 14.6 | −63.2 | 13 | 15.7 | −70.9 |
| 380–389 | 1 | 15.6 | −67.0 | 10 | 16.2 | −72.7 | 5 | 15.6 | −66.8 | 4 | 15.0 | −64.0 | | | | 4 | 15.6 | −67.2 | 9 | 16.6 | −74.0 |
| 390–399 | 4 | 16.2 | −68.0 | 7 | 16.8 | −72.1 | 5 | 16.0 | −66.6 | 1 | 16.0 | −66.0 | 1 | 15.4 | −65.0 | 3 | 16.4 | −68.7 | 7 | 17.0 | −73.6 |
| 400–409 | 4 | 16.6 | −67.8 | 3 | 17.0 | −70.7 | 3 | 16.5 | −65.0 | 2 | 15.9 | −63.5 | 1 | 16.7 | −66.0 | 3 | 16.7 | −67.7 | 2 | 17.5 | −75.5 |
| Weighted means | | 12.1 | −56.6 | | 13.7 | −62.7 | | 12.2 | −57.2 | | 12.1 | −57.8 | | 11.4 | −52.7 | | 12.0 | −57.1 | | 14.3 | −64.0 |
| Mean potential temperature (weighted) | 341.6 | | | 359.2 | | | 346.0 | | | 346.4 | | | 340.7 | | | 347.8 | | | 364.2 | | |

| Potential temperature | Minneapolis, Minn. | | | Nashville, Tenn. | | | Oakland, Calif. | | | Oklahoma City, Okla. | | | Omaha, Nebr. | | | Phoenix, Ariz. | | | St. Louis, Mo. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature |
| 290–299 | 1 | 6.6 | −42.0 | | | | | | | | | | | | | | | | | | |
| 300–309 | 2 | 7.0 | −39.0 | 1 | 6.4 | −32.0 | 2 | 6.9 | −34.0 | | | | | | | | | | 1 | 7.8 | −48.0 |
| 310–319 | 12 | 8.4 | −44.8 | 4 | 8.3 | −39.8 | 3 | 8.0 | −38.3 | | | | 8 | 8.3 | −41.6 | 1 | 7.9 | −37.0 | 5 | 8.4 | −40.6 |
| 320–329 | 20 | 10.0 | −51.4 | 11 | 9.6 | −46.3 | 21 | 9.7 | −45.4 | 7 | 9.6 | −44.7 | 24 | 9.7 | −47.2 | 10 | 9.5 | −42.0 | 19 | 9.8 | −48.7 |
| 330–339 | 15 | 11.4 | −58.1 | 14 | 11.2 | −54.1 | 20 | 11.4 | −55.8 | 14 | 11.3 | −51.3 | 29 | 11.4 | −56.8 | 24 | 10.6 | −48.0 | 17 | 11.2 | −54.9 |
| 340–349 | 4 | 12.9 | −65.8 | 13 | 12.3 | −56.9 | 12 | 12.4 | −59.8 | 12 | 12.2 | −55.5 | 12 | 12.1 | −57.2 | 18 | 12.0 | −54.6 | 11 | 12.5 | −56.4 |
| 350–359 | 1 | 12.7 | −58.0 | 7 | 13.2 | −59.4 | 4 | 13.2 | −60.8 | 12 | 13.4 | −62.0 | 10 | 13.4 | −62.4 | 4 | 13.5 | −63.0 | 4 | 13.6 | −63.2 |
| 360–369 | 1 | 14.1 | −67.0 | 5 | 14.5 | −67.0 | 6 | 14.4 | −66.2 | 9 | 14.5 | −65.8 | 4 | 14.2 | −64.0 | 8 | 13.9 | −61.3 | 7 | 14.3 | −65.4 |
| 370–379 | 2 | 14.2 | −58.5 | 7 | 14.9 | −66.0 | 7 | 14.9 | −66.9 | 9 | 15.3 | −68.3 | 3 | 14.6 | −65.0 | 5 | 15.0 | −66.0 | 10 | 15.1 | −67.5 |
| 382–389 | 1 | 15.2 | −64.0 | 5 | 16.3 | −73.8 | 6 | 15.9 | −68.8 | 8 | 15.8 | −69.2 | 5 | 15.2 | −64.4 | 8 | 16.0 | −69.9 | 3 | 15.8 | −69.0 |
| 390–399 | 2 | 14.6 | −58.0 | 5 | 16.0 | −66.0 | 6 | 16.4 | −68.3 | 4 | 16.2 | −67.8 | 2 | 15.8 | −67.0 | 8 | 16.2 | −67.5 | 2 | 16.2 | −67.0 |
| 400–409 | 2 | 16.2 | −65.5 | 3 | 16.7 | −66.7 | 3 | 16.2 | −63.3 | 5 | 17.0 | −70.0 | 3 | 16.6 | −65.3 | 7 | 16.5 | −66.3 | 3 | 16.6 | −67.0 |
| Weighted means | | 10.7 | −53.5 | | 12.7 | −57.5 | | 12.3 | −56.5 | | 13.5 | −60.3 | | 11.7 | −55.2 | | 12.8 | −56.2 | | 12.1 | −56.8 |
| Mean potential temperature (weighted) | 333.6 | | | 353.4 | | | 352.1 | | | 363.4 | | | 343.3 | | | 355.1 | | | 350.0 | | |

| Potential temperature | San Juan, P. R. | | | Saulte Ste. Marie, Mich. | | | Spokane, Wash. | | | Swan Island, W. I. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature | Number of cases | Mean altitude | Mean temperature |
| 290–299 | | | | 5 | 6.7 | −42.4 | | | | | | |
| 300–309 | | | | 11 | 7.5 | −44.6 | 1 | 7.9 | −47.0 | | | |
| 310–319 | | | | 14 | 8.9 | −49.9 | 7 | 8.6 | −44.7 | | | |
| 320–329 | | | | 18 | 10.3 | −54.5 | 21 | 10.0 | −50.8 | | | |
| 330–339 | 1 | 10.7 | −46.0 | 12 | 11.2 | −56.4 | 20 | 11.4 | −58.6 | | | |
| 340–349 | 13 | 11.9 | −50.4 | 7 | 12.1 | −57.9 | 11 | 12.4 | −61.1 | 5 | 12.5 | −57.6 |
| 350–359 | 14 | 13.4 | −59.6 | 2 | 12.8 | −60.5 | 2 | 13.4 | −64.0 | 17 | 13.8 | −64.9 |
| 360–369 | 22 | 15.0 | −69.5 | 2 | 13.7 | −59.0 | 1 | 13.1 | −58.0 | 21 | 15.2 | −73.1 |
| 370–379 | 11 | 16.3 | −75.9 | | | | 1 | 14.6 | −64.0 | 14 | 16.3 | −79.0 |
| 380–389 | 10 | 16.7 | −76.4 | | | | 4 | 15.1 | −63.8 | 13 | 16.9 | −77.6 |
| 390–399 | 9 | 17.3 | −76.3 | 2 | 15.6 | −60.5 | 1 | 15.5 | −61.0 | 6 | 17.5 | −79.7 |
| 400–409 | 6 | 17.7 | −77.0 | | | | 2 | 17.0 | −68.5 | 7 | 18.1 | −80.1 |
| Weighted means | | 15.0 | −67.6 | | 10.0 | −50.7 | | 11.4 | −56.0 | | 15.6 | −73.3 |
| Mean potential temperature (weighted) | 369.2 | | | 325.1 | | | 337.6 | | | 371.2 | | |

# AEROLOGICAL OBSERVATIONS FOR JULY

[Aerological Division, D. M. LITTLE in charge]

By B. FRANCIS DASHIELL

The 677 airplane and radiosonde upper-air observations of pressure, temperature, and humidity, shown in tables 1 and 1a, were made in the United States, Virgin Islands, Canal Zone, and Hawaii, during July 1939. The month brought about several changes, for airplane observations at Chicago, Ill., and El Paso, Tex., and the radiosonde work at Fargo, N. Dak., were discontinued. Radiosonde observations were inaugurated at Atlanta, Ga., Bismarck, N. Dak., Charleston, S. Car., Denver, Colo., El Paso, Tex., Joliet, Ill., and Miami, Fla. Charts VIII–A, IX–A, X–A, and XI–A show the distribution of mean free-air pressures and temperatures, as well as resultant wind directions and forces. Chart XII–A gives the July isentropic data, tables 2 and 3 list the winds for certain stations, and table 4 shows the heights of the various tropopauses.

Mean free-air pressures for July are shown on charts VIII–A, IX–A, X–A, and XI–A. At 5,000 feet (chart VIII–A) the pressure was lowest over the western Rocky Mountain region, and from Newfoundland (844.8 millibars) to western Canada (845.1 millibars). The lowest mean pressures in the United States occurred over Whiteface Mountain, N. Y. (845.7 millibars), Sault Ste. Marie, Mich., and southeastern Idaho (847.6 millibars). Highest pressure prevailed over the Southeast, being centered generally at Pensacola and Miami, Fla. (853.6 millibars).

At 3, 4, and 5 kilometers (charts IX–A, X–A, and XI–A) lowest mean pressure recorded during the month continued over southern Canada and the northern United States (Sault Ste. Marie, Mich., 708, 626, and 551 millibars, respectively). At these three upper levels the highest pressure prevailed over the South, being centered over Pensacola, Fla., while at 5 kilometers equal pressures persisted over Oklahoma City, Okla., and Miami, Fla.

The July mean pressure was higher than any recorded throughout the preceding months since August 1938, when radiosonde observations were inaugurated at 7 stations in the United States. Pressures noted during the preceding month of June were nearly as high, and these, together with those for the current month as well as August 1938, when combined to make up the summer season, indicated that the upper-air pressures were higher than at any other season of the year. July mean pressures in the lower levels were generally less than those recorded in August 1938, while above 6 kilometers the current pressures over Nashville, Tenn., Oakland, Calif., Oklahoma City, Okla., Omaha, Nebr., and Sault Ste. Marie, Mich., were higher than those noted in any previous month. However, at Washington, D. C., most of the July mean pressures were equalled or exceeded by those recorded in August 1938 and June 1939.

A study of July radiosonde mean upper-air pressures within the United States indicated that the existing gradient or difference in millibars at each level between the LOW and HIGH areas (Sault Ste. Marie, Mich., and Miami, Fla., respectively) increased steadily with altitude from 5 millibars at 1 kilometer to 12 millibars at 11 kilometers, and then decreased uniformly to a difference of only 1 millibar at 20 kilometers.

The month of July was characterized by high surface temperatures (°F.) over the United States except in the East and particularly the Middle Atlantic coast. Between the Mississippi River and the Rocky Mountains from Texas to Canada, abnormally high temperatures, ranging from 4° to 8° F. above normal, persisted during the month. Westward of this region the temperatures were moderately above normal. Mean temperatures (°C.) in the upper air during July were higher than throughout most of the preceding months of the fiscal year. The highest mean temperatures for the month were noted over the Central States and the southern Rocky Mountain region at 1.5, 3, and 4 kilometers, and over the Southeast at 5 kilometers. Low mean temperatures occurred over the Northeast and Newfoundland, as well as in the far Northwest, at all levels up to 5 kilometers. In the United States the lowest mean temperatures from the surface up to 3 kilometers were found over Sault Ste. Marie, Mich., but those recorded at Seattle, Wash., were considerably lower at 4 kilometers.

In the higher levels where observations are made by radiosondes, warmest free-air temperatures were located over Miami, Fla. However, these quickly shifted to Charleston, S. C., above 7 kilometers, with Miami, Fla., and El Paso, Tex., nearly as warm. But at 14 kilometers, Sault Ste. Marie, Mich., became the warmest station for the country and continued to be so at the maximum level reached –20 kilometers. In these higher levels Bismarck, N. Dak., was nearly as warm as Sault Ste. Marie, Mich., and Oakland, Calif., also encountered warm levels at 12, 13, 14, and 15 kilometers. The coldest free-air temperatures in the upper levels were noted over Sault Ste. Marie, Mich., from 1 to 11 kilometers, with Bismarck, N. Dak., recording slightly warmer temperatures. Above 11 kilometers, El Paso, Tex., was the coldest station, with Atlanta, Ga., Charleston, S. C., and Miami, Fla., only slightly warmer. But at 18 kilometers Miami, Fla., became the coldest in the United States up to a maximum altitude of 21 kilometers.

The lowest *mean* free-air temperature recorded in July was −72.2° C. over El Paso, Tex., at 16 kilometers, and the lowest *individual* temperature during the month was −75.0° C. on the 18th over Charleston, S. C., at 17 kilometers. Another low individual temperature of −73.5° C. occurred on the same date over Atlanta, Ga. (17 kilometers), and El Paso, Tex. (16 kilometers). Low temperatures also were reported on the 12th over Miami, Fla. (−74.2° C.); on the 9th at Oklahoma City, Okla., and the 7th over Nashville, Tenn. (−74.2° C.); Oakland, Calif. (−73.4° C.) on the 19th; and on the 7th at Washington, D. C. (−72.0° C.); all occurring at 16 kilometers.

Mean relative humidity for July was lowest over Oakland, Calif., and highest over El Paso, Tex. Low mean humidities in the lower levels (below 5 kilometers) occurred over San Diego, Calif., Oakland, Calif., Salt Lake City, Utah, Cheyenne, Wyo., and Spokane, Wash., all far western stations, while high humidities centered over Sault Ste. Marie, Mich., Nashville, Tenn., Wash., D. C., Norfolk, Va., Charleston, S. C., and Pensacola, Fla., all eastern and southeastern stations. At all stations (tables 1 and 1a), except two, the mean relative humidity was highest in the lower levels and lowest in the higher levels. The exceptions occurred at Denver, Colo., and El Paso, Tex., where just the reverse was true.

Upper-air wind observations by means of pilot balloons were being conducted at 97 stations within the United States during July. The larger 100-gram balloons were

in use at 23 of these stations, and higher altitudes were being reached. Helium gas replaced hydrogen at all pilot and sounding balloon stations throughout the United States proper in July. The 5 a. m. (E. S. T.) observations are indicated on charts VIII–A and IX–A, while those for 5 p. m. are shown on charts X–A and XI–A. Table 2 lists the 5 p. m. (E. S. T.) resultant winds at a number of selected stations, and table 3 shows the highest individual wind speeds recorded during the month.

A well-defined resultant-wind circulation over the southern and central portions of the country at 1.5 kilometers is shown on chart VIII–A. This circulation veered to the East and became westerly and northwesterly in the North, and to the east of the Mississippi Valley. Over this latter portion of the United States, as well as to the North and Northwest, and in Canada, winds from the northwest quadrant were found to predominate at all levels. But at 3, 4, and 5 kilometers, the southerly winds spread farther West so as to include the Pacific coast. Northwesterly winds occurred in 47, 50, 52, and 48 percent of all cases at 1.5, 3, 4, and 5 kilometers, respectively, while southwesterly winds were noted in 41, 37, 35, and 40 percent of all observations at the same levels, respectively. Resultant wind directions from the southeast quadrant occurred at all levels over Cuba, Mexico, southern Florida, and the west Gulf region. The percentage of winds from the northeast quadrant increased with altitude, being 1, 4, 5, and 11 percent of all cases at 3, 4, 5, and 6 kilometers, respectively.

Resultant wind velocities were highest at all levels over the northern and eastern sections of the country, southwest of the Great Lakes, and in the southwest Gulf region. At 1.5 kilometers highest velocities were confined to Texas, where Amarillo, Brownsville, and Del Rio, showed resultant wind speeds of 9.8, 9.4, and 9.3 meters per second, respectively. At 3 kilometers, greatest velocities were noted over Kylertown and Harrisburg, Pa., and Washington, D. C. (8.3, 7.5, and 7.5 meters per second, respectively). Highest resultant velocities at 4 kilometers were noted over the region south of the Great Lakes, and over Des Moines, Iowa, Indianapolis, Ind., Moline, Ill., and Chicago, Ill. (12.0, 11.9, 10.7, and 10.6 meters per second, respectively). This same localized area, as well as that immediately to the northwest, showed the highest velocities at 5 kilometers to be over Indianapolis, Ind., Fargo, N. Dak., Des Moines, Iowa, Cincinnati, Ohio, Minneapolis, Minn., Havre, Mont., and Bismarck, N. Dak. (13.5 13.3, 12.8, 12.7, 12.5, 12.4, and 12.4 meters per second, respectively).

Comparing the 5 a. m. (E. S. T.) July resultant directions with established 5 a. m. normals computed for a selected list of stations in the United States, it was found that the current winds departed widely from normal at 1.5 kilometers over Chicago, Ill., and at 3 kilometers over Oklahoma City, Okla. These variations were 84° and 62°, respectively. The current directions at both 1.5 and 3 kilometers over Houston, Tex., Medford, Oreg., Oakland, Calif., Sault Ste. Marie, Mich., Seattle, Wash., and Washington, D. C., departed by backing away from the normals. But at New Orleans, La., Jacksonville and Key West, Fla., Nashville, Tenn., St. Louis, Mo., and Spokane, Wash., all departures at these two levels were oriented by clockwise rotations from the normal. Velocity departures were not outstanding during July, but at 3 kilometers, over Sault Ste. Marie, Mich., and Nashville, Tenn., the velocities departed from normal by −4.6 m. p. s. and +3.0 m. p. s., respectively.

Larger departures from normal were noted when comparing the 5 p. m. July resultants with the 5 a. m. established normals for 4 and 5 kilometers. The current directions departed from normal in a clockwise rotation over Atlanta, Ga., Fargo, N. Dak., Nashville, Tenn., San Diego, Calif., New Orleans, La., and Jacksonville, Fla. The greatest departures at 4 and 5 kilometers occurred over Oklahoma City, Okla. (99° clockwise and 169° counterclockwise, respectively). Counterclockwise departures from normal were noted at Billings, Mont., Cincinnati, Ohio, Houston, Tex., Omaha, Nebr., Salt Lake City, Utah, Sault Ste. Marie, Mich., and Seattle and Spokane, Wash. The 5 p. m. velocities were generally higher than the 5 a. m. normals over most stations at 4 and 5 kilometers. With the exception of San Diego, Calif., all stations showed positive or excess departures from normal velocity at 5 kilometers. Departures at St. Louis, Mo., Nashville, Tenn., Cincinnati, Ohio, and Chicago, Ill. (stations in the same area), were the largest for the month at 4 kilometers, being +5.7, +5.6, +5.5, and +4.2 meters per second, respectively. At 5 kilometers, outstanding departures were confined also to the same region, being +10.1, +6.1, +4.3, and +3.6 meters per second at Cincinnati, Ohio, Fargo, N. Dak., Nashville, Tenn., and Omaha, Nebr., respectively.

Considerable diurnal differences were noted between the 5 a. m. and corresponding 5 p. m. resultants, at 1.5 and 3 kilometers. At 1.5 kilometers, over all stations for which 5 p. m. resultants are computed (table 2), it was noted that the p. m. winds for July had directions that varied by counterclockwise departures from the a. m. wind directions. At Billings, Mont., Salt Lake City, Utah, Sault Ste. Marie, Mich., New Orleans, La., Miami, Fla., and Little Rock, Ark., the 5 p. m. winds departed from the a. m. in clockwise rotations. At 3 kilometers, however, many of the 5 p. m. directions were separated from the 5 a. m. by clockwise orientations. At these 38 stations, the 5 p. m. winds departed from the a. m. directions by an average of 26° at both the 1.5 and 3 kilometer levels. The resultant velocities at 1.5 kilometers averaged lower at 5 p. m. than at 5 a. m., but at 3 kilometers, the afternoon velocities were higher in nearly all cases, particularly at Sault Ste. Marie, Mich. (+4.3 m. p. s.), Chicago, Ill. (+3.7 m. p. s.), and St. Louis, Mo. (+2.9 m. p. s.).

Maximum altitudes reached by pilot balloons during July showed improvement. All stations reached 6 kilometers; 52 percent exceeded 10 kilometers; 27 percent attained 15 kilometers; but only 1 percent exceeded 20 kilometers. The 5th, 13th, 14th, 15th, 22d, and 31st of July were favorable for long balloon observations. The highest altitude was reached over Huron, S. Dak., on the 18th, and at other places over Florida, west of the Mississippi, and in the southern Rocky Mountains.

This increase in high balloon observations again brought to attention the fact that easterly winds are frequent at the higher levels. Twenty-eight percent of all balloon flights ended with their maximum altitudes in winds having easterly tendencies, and of these easterly winds, 60 percent were from the northeast quadrant. In these cases winds from the southeast quadrant were encountered at 12, 13, 14, and 15 kilometers, while northeasterly directions predominated at 16, 17, and 18 kilometers. The highest elevation reached, that over Huron, S. Dak., showed an east wind at 20.7 kilometers.

Table 3 shows individual maximum wind speeds for July. The maximum of 36.4 meters per second indicated

over Sault Ste. Marie, Mich., at 2,480 meters, was one of the lowest maxima to be recorded in recent years below 2.5 kilometers. But, at Redding, Calif., the velocity of 84.0 meters per second at 19.7 kilometers, occurring on the 6th, was exceeded only three times elsewhere, and equaled in April and May of this year over the same station.

### MEAN MONTHLY ISENTROPIC CHART [1]

The mean isentropic chart, $\theta=315°$, for July 1939 (chart XII–A), shows an anticyclonic eddy over the south-central part of the country. The westerlies are displaced southward over the Northeastern States. Because of the inadequacy of the data during this month of transition from airplane to radiosonde observations, the isentropic pattern is not sufficiently certain to undertake correlation with the precipitation departures. However, it may be noted that the displacement of the westerlies southward over the Northeast was accompanied by drought conditions in August 1934, as well as in this month.

[1] Prepared by the Division of Research and Education.

TABLE 1.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in °C., and relative humidities (R. H.) in percent obtained by airplanes during July 1939*

| Stations and elevations in meters above sea level | Altitude (meters) m. s. l. | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | | | | 500 | | | 1,000 | | | 1,500 | | | 2,000 | | | 2,500 | | | 3,000 | | | 4,000 | | | 5,000 | | |
| | Number of observations | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. | P. | T. | R. H. |
| Billings, Mont. (1,090 m.) | 31 | 892 | 19.2 | 55 | | | | | | | 850 | 21.1 | 45 | 802 | 18.9 | 42 | 757 | 15.7 | 41 | 713 | 11.8 | 44 | 632 | 3.9 | 53 | 558 | −3.8 | 59 |
| Cheyenne, Wyo.[1] (1,873 m.) | 15 | 815 | 17.2 | 48 | | | | | | | | | | 803 | 20.3 | 42 | 759 | 19.2 | 36 | 715 | 15.6 | 36 | 635 | 7.8 | 40 | 561 | −1.2 | 47 |
| Coco Solo, C. Z.[2] (15 m.) | 28 | 1,010 | 26.1 | 90 | 957 | 24.2 | 86 | 904 | 22.0 | 82 | 854 | 19.8 | 80 | 806 | 17.7 | 77 | 760 | 15.8 | 66 | 717 | 13.5 | 63 | 636 | 8.2 | 68 | | | |
| Lakehurst, N. J.[2] (39 m.) | 29 | 1,011 | 19.1 | 86 | 958 | 20.1 | 72 | 904 | 17.6 | 71 | 852 | 14.5 | 72 | 803 | 11.6 | 71 | 756 | 8.8 | 69 | 712 | 6.4 | 64 | 629 | 1.4 | 52 | 555 | −3.1 | 54 |
| Norfolk, Va.[2] (10 m.) | 23 | 1,016 | 22.5 | 91 | 960 | 22.2 | 74 | 908 | 19.7 | 73 | 855 | 16.4 | 78 | 806 | 13.3 | 77 | 760 | 10.6 | 71 | 715 | 7.9 | 69 | 633 | 3.2 | 50 | 559 | −3.2 | 42 |
| Pearl Harbor, T. H.[2] (6 m.) | 31 | 1,016 | 22.8 | 79 | 960 | 19.9 | 78 | 906 | 16.1 | 83 | 854 | 13.5 | 78 | 804 | 11.5 | 65 | 758 | 10.0 | 47 | 714 | 7.5 | 36 | 631 | 2.7 | 22 | | | |
| Pensacola, Fla.[2] (13 m.) | 30 | 1,015 | 24.0 | 94 | 961 | 25.0 | 74 | 907 | 22.0 | 72 | 856 | 19.3 | 70 | 807 | 16.6 | 69 | 762 | 14.0 | 67 | 718 | 11.6 | 61 | 637 | 6.0 | 66 | 562 | 0.6 | 62 |
| St. Thomas, V. I.[2] (8 m.) | 31 | 1,018 | 27.9 | 74 | 964 | 23.6 | 88 | 910 | 20.2 | 90 | 858 | 17.5 | 82 | 810 | 15.2 | 72 | 763 | 12.8 | 61 | 718 | 10.0 | 56 | 636 | 4.2 | 52 | | | |
| Salt Lake City, Utah[3] (1,288 m.) | 22 | 871 | 19.1 | 45 | | | | | | | 850 | 24.9 | 36 | 802 | 22.7 | 32 | 758 | 19.0 | 32 | 714 | 14.8 | 33 | 634 | 6.5 | 37 | 560 | −2.2 | 42 |
| San Diego, Calif.[2] (10 m.) | 30 | 1,012 | 20.2 | 80 | 958 | 16.9 | 88 | 903 | 22.6 | 56 | 852 | 23.8 | 38 | 805 | 21.4 | 35 | 759 | 18.3 | 33 | 716 | 14.8 | 33 | 635 | 7.4 | 32 | 561 | −0.8 | 38 |
| Seattle, Wash.[2] (10 m.) | 28 | 1,017 | 17.4 | 71 | 960 | 13.7 | 77 | 905 | 12.7 | 64 | 853 | 11.3 | 56 | 803 | 8.9 | 53 | 756 | 6.3 | 49 | 711 | 3.6 | 40 | 628 | −2.9 | 38 | | | |
| Spokane, Wash. (597 m.) | 31 | 945 | 16.2 | 56 | | | | 902 | 20.8 | 40 | 851 | 18.3 | 38 | 802 | 14.1 | 41 | 756 | 10.1 | 44 | 711 | 6.4 | 47 | 629 | −0.4 | 46 | 554 | −7.0 | 42 |

[1] Observations terminated July 15, 1939.
[2] Navy.
[3] Observations terminated July 23, 1939.

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in ° C., and relative humidities (R. H.) in percent obtained by radiosondes during July 1939*

| Altitude (meters) m. s. l. | Stations and elevations in meters above sea level | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Atlanta, Ga.[1] (298 m.) | | | | Bismarck, N. Dak.[1] (508 m.) | | | | Charleston, S. C.[1] (14 m.) | | | | Denver, Colo.[1] (1,616 m.) | | | | El Paso, Tex.[2] (1,194 m.) | | | | Joliet, Ill. (178 m.) | | | | Miami, Fla.[1] (4 m.) | | | |
| | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. |
| Surface | 26 | 982 | 21.9 | 88 | 23 | 956 | 18.7 | 71 | 17 | 1,013 | 23.4 | 93 | 19 | 840 | 19.2 | 53 | 30 | 883 | 23.7 | 53 | 31 | 994 | 18.4 | 90 | 20 | 1,017 | 24.0 | 91 |
| 500 | 26 | 959 | 22.7 | 80 | | | | | 17 | 959 | 23.4 | 79 | | | | | | | | | 31 | 958 | 22.1 | 70 | 20 | 961 | 23.4 | 82 |
| 1,000 | 26 | 906 | 21.2 | 76 | 23 | 903 | 21.4 | 54 | 17 | 905 | 21.0 | 75 | | | | | | | | | 31 | 904 | 20.7 | 68 | 20 | 907 | 20.8 | 80 |
| 1,500 | 26 | 855 | 18.0 | 76 | 23 | 852 | 19.4 | 50 | 17 | 854 | 18.5 | 78 | | | | | 30 | 852 | 23.4 | 49 | 31 | 853 | 17.8 | 69 | 20 | 856 | 17.9 | 73 |
| 2,000 | 26 | 806 | 15.2 | 71 | 23 | 804 | 16.4 | 50 | 17 | 806 | 15.3 | 78 | 19 | 803 | 20.4 | 44 | 30 | 804 | 20.9 | 49 | 31 | 804 | 15.0 | 68 | 20 | 807 | 15.5 | 64 |
| 2,500 | 26 | 760 | 12.9 | 67 | 23 | 757 | 13.4 | 51 | 17 | 760 | 12.6 | 73 | 19 | 758 | 18.4 | 43 | 30 | 759 | 17.5 | 51 | 31 | 758 | 12.3 | 62 | 20 | 761 | 13.2 | 58 |
| 3,000 | 26 | 715 | 10.2 | 63 | 23 | 713 | 10.2 | 50 | 17 | 715 | 9.7 | 68 | 19 | 714 | 15.8 | 43 | 30 | 716 | 13.8 | 56 | 31 | 714 | 9.9 | 55 | 20 | 717 | 10.5 | 54 |
| 4,000 | 26 | 634 | 4.2 | 59 | 23 | 632 | 3.7 | 48 | 17 | 634 | 4.0 | 64 | 18 | 634 | 8.0 | 45 | 30 | 635 | 6.1 | 68 | 30 | 632 | 4.4 | 51 | 20 | 635 | 5.2 | 51 |
| 5,000 | 26 | 560 | −1.4 | 53 | 23 | 558 | −3.8 | 47 | 17 | 560 | −1.5 | 67 | 18 | 561 | −0.1 | 48 | 30 | 561 | −0.9 | 75 | 30 | 559 | −1.3 | 46 | 20 | 562 | −0.3 | 47 |
| 6,000 | 26 | 494 | −6.9 | 49 | 23 | 490 | −10.7 | 46 | 17 | 493 | −6.6 | 62 | 18 | 494 | −7.8 | 51 | 20 | 495 | −7.5 | 75 | 30 | 492 | −7.6 | 45 | 20 | 495 | −6.5 | 45 |
| 7,000 | 26 | 434 | −13.3 | 45 | 23 | 430 | −17.9 | 43 | 17 | 434 | −12.4 | 56 | 18 | 434 | −15.1 | 48 | 20 | 435 | −13.2 | 69 | 29 | 432 | −14.1 | 43 | 20 | 435 | −12.8 | 43 |
| 8,000 | 26 | 380 | −19.8 | 40 | 23 | 376 | −25.6 | 42 | 17 | 380 | −19.0 | 52 | 18 | 380 | −22.1 | 46 | 20 | 380 | −19.6 | 67 | 28 | 378 | −21.5 | 40 | 19 | 381 | −19.1 | 46 |
| 9,000 | 26 | 330 | −27.2 | 39 | 23 | 326 | −33.0 | 40 | 17 | 331 | −26.3 | 49 | 18 | 331 | −30.0 | 45 | 20 | 332 | −26.6 | 67 | 28 | 329 | −29.0 | 39 | 19 | 332 | −26.5 | 46 |
| 10,000 | 25 | 288 | −34.8 | 38 | 23 | 282 | −40.5 | | 17 | 288 | −33.9 | 47 | 17 | 287 | −37.6 | 46 | 20 | 289 | −34.4 | 65 | 28 | 286 | −36.2 | 39 | 19 | 289 | −34.3 | 44 |
| 11,000 | 24 | 248 | −42.9 | | 21 | 243 | −47.6 | | 17 | 249 | −41.9 | | 17 | 247 | −45.1 | | 20 | 250 | −42.4 | | 28 | 247 | −43.6 | | 19 | 250 | −42.1 | |
| 12,000 | 24 | 214 | −50.4 | | 21 | 209 | −53.2 | | 17 | 214 | −49.2 | | 17 | 213 | −51.8 | | 20 | 215 | −50.5 | | 26 | 212 | −50.3 | | 19 | 215 | −49.5 | |
| 13,000 | 24 | 183 | −57.0 | | 21 | 178 | −57.1 | | 16 | 184 | −56.3 | | 17 | 183 | −57.5 | | 20 | 184 | −58.5 | | 24 | 182 | −55.7 | | 19 | 184 | −56.6 | |
| 14,000 | 24 | 156 | −62.6 | | 21 | 152 | −60.0 | | 16 | 156 | −62.6 | | 16 | 155 | −62.5 | | 20 | 157 | −65.5 | | 23 | 155 | −60.0 | | 19 | 157 | −62.2 | |
| 15,000 | 24 | 132 | −66.8 | | 21 | 129 | −62.0 | | 16 | 132 | −66.9 | | 16 | 132 | −65.8 | | 19 | 133 | −70.2 | | 20 | 132 | −62.0 | | 19 | 133 | −60.1 | |
| 16,000 | 24 | 112 | −68.5 | | 21 | 110 | −62.0 | | 15 | 112 | −69.0 | | 15 | 112 | −66.2 | | 18 | 112 | −72.2 | | 20 | 113 | −62.9 | | 18 | 113 | −69.0 | |
| 17,000 | 23 | 95 | −68.5 | | 20 | 93 | −60.6 | | 14 | 95 | −67.8 | | 14 | 93 | −65.6 | | 17 | 94 | −71.3 | | 19 | 95 | −63.3 | | 17 | 95 | −70.2 | |
| 18,000 | 22 | 80 | −66.5 | | 18 | 80 | −59.4 | | 9 | 80 | −65.6 | | 10 | 81 | −63.5 | | 16 | 80 | −68.1 | | 15 | 81 | −62.2 | | 17 | 80 | −69.2 | |
| 19,000 | 18 | 68 | −63.8 | | 9 | 68 | −57.8 | | 8 | 68 | −64.7 | | 6 | 68 | −61.8 | | 13 | 68 | −65.2 | | 7 | 69 | −61.5 | | 13 | 68 | −67.0 | |
| 20,000 | 13 | 58 | −60.9 | | 6 | 57 | −55.6 | | 5 | 57 | −64.5 | | | | | | 7 | 57 | −62.4 | | | | | | 8 | 58 | −64.8 | |
| 21,000 | 5 | 49 | −59.2 | | | | | | | | | | | | | | | | | | | | | | 6 | 49 | −63.0 | |
| 22,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

See footnotes at end of table.

TABLE 1a.—*Mean free-air barometric pressures (P.) in mb., temperatures (T.) in ° C., and relative humidities (R. H.) in percent obtained by radiosondes during July 1939*—Continued

Stations and elevations in meters above sea level—Continued

| Altitude (meters) m. s. l. | Nashville, Tenn. (180 m.) | | | | Oakland, Calif. (2 m.) | | | | Oklahoma City, Okla. (391 m.) | | | | Omaha, Nebr. (300 m.) | | | | Sault Ste. Marie, Mich. (221 m.) | | | | Washington, D. C.[3] (7 m.) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. | Number of observations | P. | T. | R. H. |
| Surface | 31 | 994 | 22.0 | 87 | 31 | 1,015 | 14.4 | 84 | 31 | 969 | 23.6 | 70 | 31 | 979 | 22.2 | 79 | 30 | 988 | 12.8 | 93 | 28 | 1,015 | 20.3 | 87 |
| 500 | 31 | 958 | 22.8 | 75 | 31 | 957 | 14.7 | 76 | 31 | 957 | 25.1 | 62 | 31 | 957 | 23.3 | 68 | 30 | 956 | 16.2 | 78 | 28 | 959 | 19.2 | 73 |
| 1,000 | 31 | 905 | 21.1 | 73 | 31 | 903 | 21.0 | 43 | 31 | 904 | 25.6 | 51 | 31 | 904 | 22.9 | 58 | 30 | 902 | 15.6 | 71 | 28 | 905 | 16.7 | 71 |
| 1,500 | 31 | 854 | 18.0 | 75 | 31 | 852 | 20.1 | 34 | 31 | 854 | 22.6 | 50 | 31 | 854 | 20.3 | 54 | 30 | 850 | 12.5 | 73 | 28 | 853 | 13.9 | 68 |
| 2,000 | 31 | 806 | 15.2 | 72 | 31 | 803 | 17.6 | 31 | 31 | 805 | 19.5 | 49 | 31 | 805 | 18.0 | 48 | 30 | 800 | 9.2 | 74 | 28 | 804 | 11.0 | 68 |
| 2,500 | 31 | 759 | 12.8 | 61 | 31 | 757 | 14.7 | 31 | 31 | 760 | 16.1 | 48 | 31 | 759 | 14.9 | 47 | 30 | 753 | 6.4 | 70 | 28 | 757 | 8.1 | 66 |
| 3,000 | 31 | 715 | 10.5 | 56 | 31 | 714 | 11.8 | 30 | 31 | 716 | 12.6 | 47 | 31 | 715 | 11.5 | 46 | 30 | 708 | 3.9 | 63 | 27 | 712 | 5.5 | 64 |
| 4,000 | 30 | 634 | 4.4 | 52 | 31 | 633 | 5.4 | 31 | 31 | 635 | 5.6 | 50 | 31 | 634 | 4.5 | 47 | 30 | 626 | −1.7 | 56 | 27 | 630 | 1.2 | 55 |
| 5,000 | 30 | 560 | −1.9 | 51 | 31 | 559 | −1.4 | 32 | 31 | 562 | −1.2 | 45 | 30 | 560 | −2.4 | 49 | 30 | 551 | −7.1 | 49 | 26 | 555 | −3.7 | 48 |
| 6,000 | 30 | 493 | −7.8 | 49 | 31 | 492 | −8.0 | 28 | 31 | 495 | −7.7 | 39 | 30 | 493 | −8.8 | 46 | 29 | 484 | −13.4 | 45 | 26 | 488 | −9.5 | 44 |
| 7,000 | 30 | 433 | −13.8 | 44 | 31 | 432 | −15.1 | 26 | 31 | 435 | −13.9 | 34 | 30 | 432 | −15.4 | 42 | 29 | 424 | −20.2 | 44 | 25 | 429 | −15.2 | 40 |
| 8,000 | 30 | 379 | −20.5 | 42 | 31 | 378 | −22.6 | 26 | 31 | 380 | −20.4 | 34 | 30 | 378 | −22.5 | 40 | 29 | 370 | −27.7 | 43 | 24 | 375 | −21.7 | 45 |
| 9,000 | 30 | 330 | −27.7 | 39 | 31 | 329 | −30.1 | 26 | 31 | 331 | −27.4 | 32 | 30 | 329 | −29.6 | 39 | 29 | 321 | −35.6 | 42 | 23 | 327 | −28.8 | 44 |
| 10,000 | 30 | 287 | −35.4 | 39 | 31 | 285 | −37.1 | 25 | 31 | 288 | −35.2 | 32 | 30 | 286 | −37.3 | 37 | 29 | 277 | −42.7 | ------ | 23 | 284 | −36.4 | 43 |
| 11,000 | 30 | 248 | −42.8 | ------ | 31 | 246 | −44.2 | ------ | 31 | 249 | −42.8 | ------ | 30 | 246 | −44.8 | ------ | 29 | 238 | −48.3 | ------ | 21 | 245 | −43.7 | ------ |
| 12,000 | 30 | 214 | −50.0 | ------ | 31 | 212 | −50.0 | ------ | 30 | 214 | −50.0 | ------ | 30 | 212 | −51.7 | ------ | 29 | 204 | −53.1 | ------ | 21 | 211 | −50.5 | ------ |
| 13,000 | 29 | 183 | −55.5 | ------ | 31 | 182 | −54.8 | ------ | 29 | 183 | −55.7 | ------ | 30 | 181 | −55.9 | ------ | 28 | 174 | −55.8 | ------ | 20 | 180 | −56.1 | ------ |
| 14,000 | 29 | 156 | −62.0 | ------ | 30 | 155 | −59.3 | ------ | 28 | 156 | −62.4 | ------ | 30 | 154 | −60.7 | ------ | 27 | 149 | −57.8 | ------ | 16 | 154 | −61.3 | ------ |
| 15,000 | 27 | 133 | −65.9 | ------ | 30 | 132 | −63.2 | ------ | 24 | 132 | −66.6 | ------ | 30 | 132 | −63.7 | ------ | 27 | 127 | −59.5 | ------ | 15 | 130 | −63.6 | ------ |
| 16,000 | 26 | 112 | −67.4 | ------ | 30 | 112 | −64.3 | ------ | 23 | 112 | −69.1 | ------ | 30 | 112 | −65.3 | ------ | 25 | 108 | −59.6 | ------ | 12 | 111 | −64.9 | ------ |
| 17,000 | 23 | 95 | −66.7 | ------ | 29 | 95 | −63.5 | ------ | 21 | 94 | −68.2 | ------ | 29 | 94 | −64.3 | ------ | 25 | 92 | −59.3 | ------ | 9 | 94 | −64.5 | ------ |
| 18,000 | 23 | 81 | −64.2 | ------ | 27 | 81 | −61.4 | ------ | 18 | 80 | −66.4 | ------ | 28 | 80 | −62.6 | ------ | 22 | 78 | −58.6 | ------ | 5 | 80 | −62.8 | ------ |
| 19,000 | 13 | 69 | −62.1 | ------ | 25 | 69 | −59.0 | ------ | 14 | 68 | −64.1 | ------ | 23 | 68 | −60.5 | ------ | 15 | 67 | −57.4 | ------ | ------ | ------ | ------ | ------ |
| 20,000 | 7 | 58 | −59.7 | ------ | 21 | 59 | −56.8 | ------ | 13 | 57 | −62.1 | ------ | 14 | 58 | −58.5 | ------ | 7 | 57 | −56.1 | ------ | ------ | ------ | ------ | ------ |
| 21,000 | 5 | 49 | −58.0 | ------ | 12 | 50 | −54.9 | ------ | 7 | 49 | −60.4 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| 22,000 | ------ | ------ | ------ | ------ | 5 | 43 | −53.0 | ------ | 5 | 41 | −58.7 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

Observations taken about 4 a. m. 75th meridian time.

[1] Observations began at these new radiosonde stations between July 6 and 14, 1939.
[2] First 10 days were airplane observations.
[3] Navy.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels, also, the humidity data are not used in daily observations when the temperature is below —40° C.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (E. S. T.) during July 1939*

[Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second (superior figures indicate number of observations)]

| Altitude (meters) m. s. l. | Abilene, Tex. (537 m.) | | Albuquerque, N. Mex. (1,554 m.) | | Atlanta, Ga. (302 m.) | | Billings, Mont. (1,095 m.) | | Boise, Idaho (850 m.) | | Brooklyn, N. Y. (15 m.) | | Brownsville, Tex. (7 m.) | | Buffalo, N. Y. (220 m.) | | Burlington, Vt. (132 m.) | | Charleston, S. C. (18 m.) | | Cheyenne, Wyo. (1,873 m.) | | Chicago, Ill. (192 m.) | | Cincinnati, Ohio (157 m.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | 168 | $3.6^{3}$ | 116 | $1.3^{31}$ | 279 | $1.4^{31}$ | 83 | $0.2^{31}$ | 294 | $3.7^{31}$ | 180 | $5.0^{28}$ | 142 | $6.4^{30}$ | 253 | $3.1^{31}$ | 255 | $1.1^{31}$ | 171 | $2.7^{31}$ | 184 | $1.5^{31}$ | 123 | $1.1^{31}$ | 263 | $0.5^{31}$ |
| 500 | ------ | ------ | ------ | ------ | 273 | $2.1^{31}$ | 276 | $0.4^{31}$ | ------ | ------ | 204 | $3.6^{30}$ | 151 | $7.5^{29}$ | 262 | $3.8^{31}$ | 235 | $1.7^{31}$ | 180 | $3.8^{31}$ | ------ | ------ | 173 | $1.2^{31}$ | 280 | $1.2^{31}$ |
| 1,000 | 163 | $4.9^{31}$ | ------ | ------ | 281 | $2.8^{31}$ | 254 | $1.4^{31}$ | 300 | $3.2^{31}$ | 255 | $3.2^{28}$ | 164 | $6.3^{27}$ | 257 | $4.6^{31}$ | 249 | $3.2^{31}$ | 222 | $3.2^{31}$ | ------ | ------ | 224 | $2.7^{31}$ | 281 | $2.2^{30}$ |
| 1,500 | 162 | $4.6^{31}$ | ------ | ------ | 294 | $3.1^{31}$ | 257 | $3.0^{31}$ | 310 | $2.6^{31}$ | 276 | $3.9^{29}$ | 162 | $5.7^{31}$ | 259 | $3.6^{30}$ | 258 | $4.0^{31}$ | 246 | $3.5^{31}$ | ------ | ------ | 274 | $2.7^{31}$ | 290 | $2.7^{30}$ |
| 2,000 | 164 | $4.4^{31}$ | 174 | $1.0^{31}$ | 309 | $3.8^{29}$ | 255 | $5.1^{31}$ | 280 | $1.4^{31}$ | 290 | $4.2^{28}$ | 144 | $4.8^{26}$ | 268 | $3.9^{30}$ | 266 | $5.0^{30}$ | 269 | $3.5^{19}$ | 184 | $1.7^{31}$ | 307 | $4.0^{31}$ | 297 | $3.8^{27}$ |
| 2,500 | 166 | $3.7^{31}$ | 228 | $0.9^{31}$ | 323 | $4.3^{28}$ | 252 | $8.5^{28}$ | 256 | $3.1^{31}$ | 285 | $5.3^{27}$ | 128 | $4.2^{16}$ | 269 | $4.2^{23}$ | 257 | $5.0^{28}$ | 280 | $4.0^{18}$ | 197 | $1.3^{31}$ | 310 | $6.2^{31}$ | 311 | $4.9^{28}$ |
| 3,000 | 168 | $3.6^{30}$ | 292 | $1.2^{31}$ | 329 | $4.5^{24}$ | 250 | $11.3^{28}$ | 245 | $4.9^{31}$ | 293 | $6.6^{26}$ | 130 | $4.4^{14}$ | 282 | $4.2^{31}$ | 267 | $5.0^{31}$ | 285 | $4.0^{17}$ | 237 | $1.5^{31}$ | 316 | $8.5^{17}$ | 310 | $6.7^{31}$ |
| 4,000 | 178 | $2.9^{26}$ | 348 | $1.6^{30}$ | 336 | $5.0^{24}$ | 255 | $13.1^{28}$ | 247 | $7.0^{29}$ | 286 | $7.8^{21}$ | 109 | $3.9^{13}$ | 287 | $4.8^{14}$ | 294 | $4.2^{17}$ | 327 | $4.7^{13}$ | 278 | $3.9^{30}$ | 316 | $10.6^{13}$ | 308 | $9.9^{26}$ |
| 5,000 | 188 | $2.7^{23}$ | 49 | $1.7^{27}$ | 344 | $5.8^{20}$ | 250 | $15.6^{26}$ | 249 | $8.8^{26}$ | 302 | $8.8^{14}$ | ------ | ------ | ------ | ------ | ------ | ------ | 330 | $3.8^{10}$ | 263 | $5.7^{28}$ | ------ | ------ | 321 | $12.6^{13}$ |
| 6,000 | 208 | $2.8^{19}$ | 29 | $1.0^{23}$ | 328 | $4.6^{17}$ | 256 | $12.9^{16}$ | 262 | $9.0^{22}$ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 268 | $5.9^{19}$ | ------ | ------ | ------ | ------ |
| 8,000 | 213 | $2.2^{13}$ | 100 | $1.7^{19}$ | 308 | $5.5^{13}$ | ------ | ------ | 252 | $11.3^{19}$ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 274 | $10.7^{16}$ | ------ | ------ | ------ | ------ |
| 10,000 | 169 | $0.9^{12}$ | 178 | $1.1^{13}$ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 258 | $15.2^{14}$ | ------ | ------ | ------ | ------ |
| 12,000 | 155 | $1.5^{10}$ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 254 | $17.6^{10}$ | ------ | ------ | ------ | ------ |

| Altitude (meters) m. s. l. | El Paso, Tex. (1,196 m.) | | Fargo, N. Dak. (283 m.) | | Greensboro, N. C. (271 m.) | | Havre, Mont. (766 m.) | | Houston, Tex. (21 m.) | | Huron, S. Dak. (393 m.) | | Las Vegas, Nev. (570 m.) | | Little Rock, Ark. (82 m.) | | Medford, Oreg. (410 m.) | | Miami, Fla. (10 m.) | | Minneapolis, Minn. (261 m.) | | Nashville, Tenn. (194 m.) | | New Orleans, La. (19 m.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | 147 | $1.5^{31}$ | 182 | $0.8^{30}$ | 229 | $1.2^{30}$ | 243 | $1.4^{31}$ | 175 | $2.1^{29}$ | 171 | $1.6^{31}$ | 203 | $2.4^{31}$ | 178 | $0.9^{31}$ | 308 | $2.5^{30}$ | 137 | $2.8^{29}$ | 251 | $1.3^{29}$ | 281 | $1.1^{31}$ | 227 | $0.9^{31}$ |
| 500 | ------ | ------ | 210 | $1.6^{30}$ | 208 | $1.9^{30}$ | ------ | ------ | 185 | $3.6^{29}$ | 177 | $1.9^{31}$ | ------ | ------ | 179 | $0.7^{31}$ | 311 | $2.7^{30}$ | 163 | $3.0^{29}$ | 224 | $2.1^{29}$ | 287 | $1.7^{31}$ | 211 | $2.1^{31}$ |
| 1,000 | ------ | ------ | 227 | $2.4^{30}$ | 229 | $2.9^{30}$ | 243 | $2.1^{31}$ | 190 | $2.2^{29}$ | 199 | $2.3^{31}$ | 193 | $2.7^{31}$ | 211 | $1.0^{30}$ | 322 | $2.6^{30}$ | 172 | $2.6^{27}$ | 219 | $3.3^{29}$ | 273 | $1.8^{31}$ | 244 | $1.7^{31}$ |
| 1,500 | 164 | $1.0^{31}$ | 269 | $2.9^{29}$ | 250 | $3.3^{30}$ | 248 | $2.6^{31}$ | 187 | $1.8^{27}$ | 226 | $2.7^{31}$ | 198 | $3.0^{31}$ | 281 | $2.1^{30}$ | 292 | $1.4^{30}$ | 201 | $1.8^{27}$ | 229 | $3.5^{29}$ | 280 | $1.8^{29}$ | 289 | $1.7^{29}$ |
| 2,000 | 103 | $0.5^{31}$ | 291 | $4.9^{29}$ | 264 | $4.3^{26}$ | 256 | $5.3^{31}$ | 172 | $1.8^{28}$ | 254 | $3.7^{30}$ | 198 | $3.4^{31}$ | 289 | $3.0^{29}$ | 216 | $2.9^{30}$ | 216 | $1.4^{26}$ | 267 | $4.4^{25}$ | 319 | $3.3^{31}$ | 311 | $2.3^{30}$ |
| 2,500 | 85 | $1.3^{31}$ | 292 | $7.2^{28}$ | 285 | $5.2^{24}$ | 254 | $7.0^{31}$ | 143 | $1.5^{28}$ | 269 | $5.8^{26}$ | 211 | $3.3^{31}$ | 309 | $3.5^{28}$ | 213 | $5.3^{30}$ | 202 | $1.2^{23}$ | 279 | $5.7^{28}$ | 332 | $4.8^{28}$ | 338 | $1.9^{24}$ |
| 3,000 | 85 | $1.8^{31}$ | 294 | $8.9^{27}$ | 286 | $6.4^{24}$ | 248 | $8.9^{29}$ | 139 | $2.4^{30}$ | 270 | $8.2^{29}$ | 216 | $4.2^{31}$ | 324 | $2.9^{27}$ | 220 | $6.8^{29}$ | 196 | $1.5^{22}$ | 301 | $7.7^{28}$ | 330 | $6.3^{29}$ | 356 | $3.0^{24}$ |
| 4,000 | 80 | $2.0^{29}$ | 294 | $11.0^{26}$ | 303 | $7.7^{16}$ | 257 | $10.6^{24}$ | 67 | $1.4^{16}$ | 277 | $10.9^{26}$ | 212 | $5.6^{31}$ | 338 | $3.5^{27}$ | 223 | $7.5^{28}$ | 174 | $1.8^{20}$ | 299 | $10.5^{16}$ | 331 | $6.9^{26}$ | 48 | $2.4^{23}$ |
| 5,000 | 90 | $1.9^{28}$ | 299 | $13.3^{22}$ | 304 | $8.4^{11}$ | 262 | $12.4^{19}$ | 40 | $3.5^{10}$ | 278 | $12.6^{27}$ | 220 | $5.0^{29}$ | 352 | $3.8^{24}$ | 230 | $9.9^{24}$ | 161 | $2.3^{17}$ | 302 | $12.5^{13}$ | 321 | $7.7^{19}$ | 46 | $3.9^{22}$ |
| 6,000 | 160 | $2.2^{26}$ | 298 | $14.6^{20}$ | 309 | $9.2^{10}$ | 263 | $12.4^{15}$ | ------ | ------ | 286 | $13.6^{20}$ | 230 | $4.5^{26}$ | 340 | $4.6^{22}$ | 235 | $11.1^{21}$ | 156 | $2.7^{16}$ | 302 | $13.0^{11}$ | 316 | $7.3^{14}$ | 73 | $2.4^{14}$ |
| 8,000 | 88 | $1.6^{20}$ | 294 | $16.4^{13}$ | ------ | ------ | 266 | $11.0^{12}$ | ------ | ------ | 281 | $16.3^{21}$ | 241 | $4.9^{23}$ | 286 | $2.8^{15}$ | 242 | $19.5^{12}$ | 87 | $3.1^{10}$ | ------ | ------ | ------ | ------ | ------ | ------ |
| 10,000 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 282 | $18.2^{14}$ | 239 | $7.0^{20}$ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| 12,000 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 290 | $16.2^{11}$ | 239 | $10.0^{20}$ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| 14,000 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 240 | $9.5^{17}$ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5. p. m. (E. S. T.) during July 1939*—Continued

| Altitude (meters) m. s. l. | Oakland, Calif. (8 m.) | | Oklahoma City, Okla. (402 m.) | | Omaha, Nebr. (306 m.) | | Reno, Nev. (1,346 m.) | | St. Louis, Mo. (170 m.) | | Salt Lake City, Utah (1,294 m.) | | San Diego, Calif. (15 m.) | | San Juan, P. R. (16 m.) | | Sault Ste. Marie, Mich. (198 m.) | | Seattle, Wash. (14 m.) | | Spokane, Wash. (603 m.) | | Washington, D. C. (10 m.) | | Winslow, Ariz. (1,488 m.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | 277 | 5.0[28] | 177 | 3.3[31] | 136 | 2.0[31] | 274 | 1.2[31] | 213 | 1.5[31] | 226 | 0.5[31] | 263 | 4.0[31] | 82 | 7.7[31] | 282 | 3.6[31] | 277 | 2.3[31] | 219 | 2.6[31] | 243 | 1.0[31] | 245 | 1.5[31] |
| 500 | 266 | 3.6[30] | 175 | 3.6[31] | 153 | 2.2[31] | ------ | ------ | 209 | 1.1[31] | ------ | ------ | 271 | 2.1[31] | 93 | 9.4[31] | 287 | 5.5[31] | 271 | 1.3[31] | ------ | ------ | 249 | 2.4[31] | ------ | ------ |
| 1,000 | 248 | 2.9[29] | 183 | 4.0[31] | 182 | 1.7[31] | ------ | ------ | 237 | 1.4[31] | ------ | ------ | 291 | 1.5[30] | 105 | 8.3[30] | 282 | 5.5[31] | 238 | 1.9[30] | 221 | 3.5[31] | 265 | 2.4[31] | ------ | ------ |
| 1,500 | 233 | 2.0[27] | 192 | 3.1[31] | 220 | 2.6[30] | 260 | 1.2[31] | 278 | 2.4[30] | 223 | 0.7[31] | 278 | 0.7[30] | 108 | 7.7[29] | 280 | 5.1[31] | 251 | 2.4[29] | 222 | 4.0[31] | 267 | 4.4[29] | ------ | ------ |
| 2,000 | 207 | 2.9[27] | 210 | 3.0[31] | 248 | 3.1[29] | 244 | 1.5[31] | 286 | 5.1[30] | 191 | 1.0[31] | 199 | 0.8[29] | 100 | 7.8[27] | 293 | 5.7[28] | 229 | 3.2[27] | 217 | 4.8[29] | 282 | 5.6[30] | 242 | 1.7[31] |
| 2,500 | 203 | 3.6[27] | 207 | 3.1[31] | 278 | 4.9[27] | 232 | 2.2[31] | 294 | 7.1[31] | 209 | 1.9[31] | 198 | 2.0[30] | 93 | 7.6[31] | 296 | 5.9[31] | 229 | 3.3[24] | 227 | 5.7[29] | 295 | 6.9[32] | 230 | 1.9[31] |
| 3,000 | 214 | 3.9[28] | 204 | 3.3[31] | 284 | 6.2[28] | 232 | 3.5[31] | 312 | 8.1[19] | 219 | 2.5[31] | 209 | 2.4[30] | 90 | 7.4[23] | 301 | 8.0[23] | 223 | 4.2[28] | 235 | 7.0[23] | 293 | 7.9[21] | 234 | 0.9[31] |
| 4,000 | 211 | 4.6[28] | 203 | 3.1[29] | 289 | 7.4[26] | 235 | 5.2[29] | 323 | 9.7[14] | 228 | 4.0[29] | 172 | 3.0[28] | 94 | 6.3[22] | 295 | 9.5[23] | 243 | 6.8[16] | 241 | 9.7[24] | ------ | ------ | 221 | 1.9[30] |
| 5,000 | 217 | 6.6[24] | 201 | 1.6[24] | 300 | 9.0[26] | 236 | 7.8[27] | ------ | ------ | 236 | 6.8[26] | 166 | 3.8[22] | 92 | 6.8[18] | 301 | 10.4[20] | 244 | 8.5[16] | 247 | 10.8[23] | ------ | ------ | 173 | 1.3[22] |
| 6,000 | 221 | 6.3[19] | 205 | 2.6[21] | 305 | 9.7[25] | 235 | 8.3[26] | ------ | ------ | 238 | 10.2[21] | 173 | 2.0[13] | 73 | 5.7[18] | 304 | 10.7[15] | 253 | 7.9[12] | 277 | 9.8[12] | ------ | ------ | 121 | 2.1[20] |
| 8,000 | 249 | 4.6[17] | 167 | 0.7[21] | 292 | 10.3[24] | 254 | 10.5[23] | ------ | ------ | 248 | 10.5[15] | ------ | ------ | 90 | 3.8[11] | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 145 | 2.5[19] |
| 10,000 | ------ | ------ | 272 | 2.2[22] | 293 | 11.7[20] | 268 | 14.0[18] | ------ | ------ | ------ | ------ | ------ | ------ | 77 | 1.3[10] | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 215 | 3.7[17] |
| 12,000 | ------ | ------ | 292 | 3.2[19] | 284 | 12.4[16] | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 234 | 6.3[16] |
| 14,000 | ------ | ------ | 254 | 2.1[16] | 297 | 9.6[13] | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 214 | 5.2[11] |

TABLE 3.—*Maximum free-air wind velocities (M. P. S.), for different sections of the United States based on pilot balloon observations during July 1939*

| Section | Surface to 2,500 meters (m. s. l.) | | | | | Between 2,500 and 5,000 meters (m. s. l.) | | | | | Above 5,000 meters (m. s. l.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m.) m. s. l. | Date | Station |
| Northeast [1] | 26.3 | SW | 1,180 | 14 | Hartford, Conn. | 32.0 | NW | 4,320 | 2 | Albany, N. Y. | 34.5 | WSW | 10,420 | 24 | Cleveland, Ohio. |
| East-Central [2] | 26.0 | N | 2,260 | 14 | Nashville, Tenn. | 38.0 | WSW | 4,280 | 1 | Richmond, Va. | 28.2 | WNW | 6,330 | 14 | Knoxville, Tenn. |
| Southeast [3] | 21.3 | NNW | 2,300 | 15 | Birmingham, Ala. | 31.6 | NNW | 3,890 | 15 | Birmingham, Ala. | 27.6 | NNW | 8,310 | 11 | Atlanta, Ga. |
| North-Central [4] | 36.4 | N | 2,480 | 15 | Sault Ste. Marie, Mich. | 39.8 | NNW | 2,660 | 15 | Sault Ste. Marie, Mich. | 53.2 | WSW | 10,350 | 21 | Huron, S. Dak. |
| Central [5] | 31.0 | W | 911 | 12 | Des Moines, Iowa. | 38.4 | NNW | 3,110 | 14 | Evansville, Ind. | 30.6 | SW | 10,350 | 24 | Moline, Ill. |
| South-Central [6] | 31.4 | NNE | 1,840 | 11 | Del Rio, Tex. | 25.1 | N | 2,830 | 9 | Oklahoma City, Okla. | 32.8 | W | 7,010 | 19 | Little Rock, Ark. |
| Northwest [7] | 32.4 | NW | 1,900 | 20 | Billings, Mont. | 51.8 | WSW | 3,070 | 10 | Pocatello, Idaho. | 44.0 | WSW | 8,260 | 20 | Billings, Mont. |
| West-Central [8] | 34.2 | SSE | 2,500 | 9 | Ely, Nev. | 48.5 | S | 5,000 | 12 | Ely, Nev. | 84.0 | W | 19,710 | 6 | Redding, Calif. |
| Southwest [9] | 27.3 | S | 1,770 | 8 | Albuquerque, N. Mex. | 24.8 | WSW | 3,810 | 2 | Sandberg, Calif. | 53.8 | WSW | 13,900 | 1 | Las Vegas, Nev. |

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during July 1939, classified according to the potential temperatures (10-degree intervals between 290° and 409° A.) with which they are identified (based on radiosonde observations)*

| Potential temperatures | Atlanta, Ga. | | | Bismarck, N. Dak. | | | Charleston, S. C. | | | Denver, Colo. | | | El Paso, Tex. | | | Joliet, Ill. | | | Miami, Fla. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature |
| 290–299 | | | | | | | | | | | | | | | | | | | | | |
| 300–309 | | | | | | | | | | | | | | | | | | | | | |
| 310–319 | | | | | | | | | | | | | | | | | | | | | |
| 320–329 | | | | 6 | 9.7 | −44.0 | | | | | | | | | | 2 | 9.1 | −37.5 | | | |
| 330–339 | 1 | 11.0 | −48.0 | 16 | 11.1 | −50.5 | | | | 6 | 10.9 | −46.5 | | | | 11 | 10.2 | −41.2 | 2 | 12.0 | −59.0 |
| 340–349 | 17 | 12.1 | −53.1 | 13 | 12.1 | −54.3 | 7 | 12.0 | −51.1 | 10 | 12.0 | −52.5 | 10 | 12.8 | −58.6 | 20 | 11.7 | −50.7 | 7 | 12.0 | −51.4 |
| 350–359 | 18 | 13.4 | −60.4 | 12 | 13.2 | −59.8 | 11 | 13.6 | −62.0 | 8 | 13.4 | −60.0 | 14 | 13.9 | −63.6 | 13 | 13.4 | −59.5 | 21 | 13.5 | −60.5 |
| 360–369 | 18 | 14.8 | −66.5 | 5 | 14.2 | −63.0 | 5 | 14.6 | −65.0 | 7 | 14.6 | −65.3 | 13 | 15.1 | −69.9 | 6 | 13.8 | −58.2 | 6 | 14.6 | −65.2 |
| 370–379 | 5 | 15.5 | −69.0 | 8 | 14.9 | −63.6 | 9 | 15.7 | −70.3 | 7 | 13.0 | −65.7 | 5 | 15.8 | −72.4 | 7 | 14.8 | −62.7 | 9 | 15.6 | −68.0 |
| 380–389 | 13 | 16.1 | −69.4 | 4 | 15.4 | −64.2 | 3 | 16.0 | −69.0 | 3 | 15.6 | −65.0 | 4 | 16.5 | −73.2 | 6 | 15.5 | −64.3 | 5 | 16.1 | −68.4 |
| 390–399 | 4 | 16.6 | −70.8 | 5 | 16.0 | −65.0 | 4 | 17.1 | −72.0 | | | | 2 | 17.0 | −72.5 | 3 | 15.9 | −63.0 | 6 | 16.9 | −69.0 |
| 400–409 | 3 | 17.3 | −69.0 | | | | | | | 2 | 17.0 | −68.0 | 3 | 17.4 | −70.7 | 3 | 17.0 | −60.3 | 5 | 17.4 | −71.2 |
| Weighted means | | 14.3 | −62.9 | | 12.8 | −55.5 | | 14.5 | −62.3 | | 13.2 | −58.9 | | 14.7 | −66.6 | | 12.9 | −54.6 | | 14.5 | −63.3 |
| Mean potential temperature (weighted) [1] | | 364.7 | | | 353.7 | | | 364.9 | | | 358.4 | | | 378.5 | | | 357.2 | | | 367.1 | |

| Potential temperature | Nashville, Tenn. | | | Oakland, Calif. | | | Oklahoma City, Okla | | | Omaha, Nebr. | | | Sault Ste. Marie Mich. | | | Washington, D. C. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature | Number of cases | Mean altitude (km.) m. s. l. | Mean temperature |
| 290–299 | | | | | | | | | | | | | | | | | | |
| 300–309 | | | | | | | | | | | | | | | | | | |
| 310–319 | | | | | | | | | | | | | 2 | 8.6 | −44.5 | | | |
| 320–329 | 2 | 10.4 | −47.5 | | | | | | | | | | 12 | 9.6 | −44.1 | | | |
| 330–339 | 4 | 10.8 | −44.8 | 10 | 10.5 | −43.7 | 1 | 10.9 | −46.0 | 8 | 11.0 | −47.8 | 24 | 11.1 | −52.4 | 7 | 10.2 | −42.1 |
| 340–349 | 18 | 11.4 | −47.3 | 25 | 11.5 | −48.6 | 9 | 12.1 | −52.3 | 22 | 12.2 | −54.0 | 17 | 12.2 | −55.8 | 11 | 12.3 | −55.7 |
| 350–359 | 23 | 13.1 | −57.1 | 10 | 13.2 | −56.9 | 17 | 13.4 | −60.3 | 13 | 13.4 | −60.2 | 10 | 13.1 | −58.4 | 5 | 13.4 | −61.4 |
| 360–369 | 16 | 14.5 | −65.3 | 14 | 14.4 | −63.4 | 12 | 14.9 | −67.8 | 17 | 14.3 | −63.1 | 6 | 14.1 | −63.3 | 4 | 13.3 | −54.5 |
| 370–379 | 11 | 15.4 | −68.5 | 10 | 15.0 | −64.0 | 9 | 15.5 | −68.8 | 11 | 15.1 | −65.3 | 3 | 14.4 | −61.3 | 2 | 14.0 | −52.5 |
| 380–389 | 6 | 15.8 | −66.2 | 9 | 15.7 | −65.1 | 6 | 16.1 | −69.0 | 10 | 16.0 | −66.8 | 12 | 15.0 | −61.0 | | | |
| 390–399 | 5 | 16.6 | −68.6 | 5 | 16.2 | −66.2 | 5 | 16.6 | −68.4 | 9 | 16.3 | −65.4 | 2 | 15.6 | −63.0 | 2 | 16.1 | −67.0 |
| 400–409 | 3 | 17.1 | −68.3 | 5 | 16.8 | −65.0 | 1 | 17.7 | −74.0 | 3 | 16.7 | −65.0 | 2 | 16.2 | −64.5 | 1 | 16.6 | −63.0 |
| Weighted means | | 13.7 | −58.9 | | 13.4 | −56.7 | | 14.4 | −63.4 | | 13.9 | −60.2 | | 12.3 | −55.1 | | 12.6 | −54.2 |
| Mean potential temperature (weighted) [1] | | 360.8 | | | 361.7 | | | 365.1 | | | 363.8 | | | 349.9 | | | 353.2 | |

[1] Applies to tables for previous months also.

## RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD, in charge]

By BENNETT SWENSON

The precipitation during the month of October 1939 was decidedly deficient over much of the country and the majority of the rivers were unusually low at the close of the month.

No floods were reported with the exception of one in the lower Rio Grande on October 12–14. This flood resulted from heavy rains on the 10th to 11th which were centered principally over the tributaries which enter the lower Rio Grande from the Mexican side.

These rains resulted in a sharp increase of the stages in the river from Rio Grande City, Tex., downstream. Flood stages were exceeded slightly at a few points including Rio Grande City and Mercedes, Tex., where crest stages of 21.6 and 21.4 feet, respectively, were reached. However, very little water overflowed on the American side of the river, and no appreciable damages resulted.

*Table of flood stages, October 1939*

| River and station | Flood stage | Above flood stages—dates | | Crest | |
|---|---|---|---|---|---|
| | | From— | To— | Stage | Date |
| *West Gulf Drainage* | | | | | |
| Rio Grande: | *Feet* | | | *Feet* | |
| Rio Grande City, Tex. | 21 | 12 | 12 | 21.6 | 12 |
| Mercedes, Tex. | 21 | 13 | 14 | 21.4 | 14 |

# WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, WILLIS E. HURD, acting in charge]

## NORTH ATLANTIC OCEAN, OCTOBER 1939

By H. C. HUNTER

*Atmospheric pressure.*—The data now available indicate that the pressure averaged less than normal over most of the North Atlantic, and that the deficiency was particularly large over the northwestern portion. There was a moderate excess near the Azores and a slight excess near the coasts of Florida and the Middle Gulf States.

The extremes of pressure in the vessel reports at hand were 1034.5 and 941.4 millibars (30.55 and 27.80 inches.) The high reading was noted on the Dutch liner *Statendam* late on the forenoon of the 25th, near 51° N., 21° W. The low reading was recorded on the American steamship *F. W. Abrams*, near the center of the month's chief disturbance of tropical origin. The position was 26°36′ N., 66°48′ W., or approximately midway between the Mona Passage and Bermuda; and the hour was 7:50 a. m. of the 15th.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, October 1939*

| Station | Average pressure | Departure | Highest | Date | Lowest | Date |
|---|---|---|---|---|---|---|
| | *Millibars* | *Millibars* | *Millibars* | | *Millibars* | |
| Julianehaab, Greenland [1] | 1,000.6 | −6.5 | 1,019 | 9 | 980 | 17 |
| Horta, Azores | 1,021.2 | +1.6 | 1,031 | 24 | 1,004 | 2 |
| Belle Isle, Newfoundland [2] | | | 1,032 | 30 | 981 | 29 |
| Halifax, Nova Scotia [3] | 1,015.7 | −1.6 | 1,030 | 3, 30 | 989 | 23 |
| Nantucket | 1,016.0 | −1.0 | 1,030 | 18 | 990 | 31 |
| Hatteras | 1,017.6 | −0.4 | 1,030 | 18 | 1,000 | 31 |
| Turks Island | 1,013.0 | −1.2 | 1,017 | 19, 25, 26 | 1,005 | 13, 14 |
| Key West | 1,014.2 | +0.3 | 1,020 | 26 | 1,006 | 31 |
| New Orleans | 1,017.9 | +1.0 | 1,023 | 17 | 1,014 | 11 |

[1] For 21 days.
[2] For 17 days.
[3] For 22 days.

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

*Cyclones and gales.*—Disturbances of extratropical origin affected the North Atlantic considerably more than during the preceding month. During the first 2 days of October gales were encountered by several vessels between the Azores and the strait of Gibraltar; also during the first 5 days several gales were reported between Newfoundland and the English Channel.

Early on the 4th a LOW of slight energy was centered a short distance to southward of Nantucket, whence it traveled eastward, gaining in strength, and becoming the southwest portion of an extensive LOW system. The morning of the 8th found a strong LOW near 52° N., 23° W. Whole gales were noted by two vessels when within its influence and lesser gales by several other ships.

During the final few days of October many parts of the western North Atlantic to northward of the 40th parallel were considerably disturbed, also some areas just east of the United States coast. On the morning of the 31st a long LOW system extended from a short distance northeast of Cape Cod southwestward to the western Caribbean where a tropical disturbance was centered. Apart from this latter center, the chief LOW was near Hatteras on the morning of the 31st and near Nantucket on the evening of that day. There were several reports of strong to whole gales from vessels near the United States coast as a result of this LOW system.

*Tropical cyclones.*—One important hurricane, that of the 12th to 18th, occurred in October. The disturbance at first lay near the Leeward Islands and to northeastward of Puerto Rico, with no great strength, but hurricane force was developed before it reached the waters just east of Bermuda and continued until the storm was lost to observation east of northern Newfoundland. A full account of this storm appears elsewhere in this issue of the REVIEW.

Just before the month ended a depression over the western Caribbean gained marked strength. It was near Grand Cayman Island on the 30th, and thereafter followed an unusual course until November 6. An account of this storm will appear in a subsequent issue of the REVIEW.

*Fog.*—There was decidedly little fog, as far as reports indicate. The squares 40° to 45° N., 65° to 70° W., and 35° to 40° N., 70° to 75° W., both along the northeastern coast of the United States, led in reports, having 4 days each; while two different Grand Banks squares and one square in the northwestern Gulf of Mexico had 3 days with fog. There was scarcely a report of fog from any locality east of the 45th meridian.

Compared with the preceding September, October had less fog nearly everywhere save in the northern Gulf of Mexico, where no fog had been reported in September. Except for this region and the vicinity of Delaware Bay the present October seems to have been less foggy than normal for the month; the deficiency was marked over the southern Grand Banks region, where from 8 to 10 days with fog are to be expected in October.

## OCEAN GALES AND STORMS, OCTOBER 1939

| Vessel | Voyage | | Position at time of lowest barometer | | Gale began October | Time of lowest barometer, October | Gale ended October | Lowest barometer | Direction of wind when gale began | Direction and force of wind at time of lowest barometer | Direction of wind when gale ended | Direction and highest force of wind | Shifts of wind near time of lowest barometer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From— | To— | Latitude | Longitude | | | | | | | | | |
| **NORTH ATLANTIC OCEAN** | | | ° ′ | ° ′ | | | | *Millibars* | | | | | |
| Exhibitor, Am. S. S. | Gibraltar | New York | 37 21 N. | 19 40 W. | 1 | 9a, 1 | 1 | 988.8 | S | S, 10 | NW | S, 10 | S-NW. |
| Do | do | do | 38 00 N. | 23 24 W. | 2 | 10a, 2 | 2 | 998.3 | W | W, 9 | | W, 9 | W-NW. |
| Kentucky, Dan. S. S. | Gothenburg | do | [1] 50 38 N. | 45 04 W. | 3 | 4p, 2 | 3 | 1,005.1 | NW | W, 7 | N | N, 10 | WSW-NW. |
| Black Condor, Am. S. S. | Antwerp | do | 50 55 N. | 20 00 W. | 4 | 10a, 4 | 5 | 996.6 | SSE | SW, 6 | W | NW, 9 | SSE-SW-NW. |
| Aquarius, Am. S. S. | Liverpool | New Orleans | 31 38 N. | 56 00 W. | 5 | 8a, 5 | 5 | 1,011.2 | S | S, 8 | WSW | S, 8 | S-SSW. |
| Indien, Belg. S. S. | Antwerp | New York | 40 30 N. | 8 42 W. | 5 | 11a, 5 | 6 | 989.5 | WSW | SW, 5 | WNW | WNW, 10 | SW-W. |
| Exhibitor, Am. S. S. | Gibraltar | do | 39 48 N. | 44 12 W. | 6 | 8p, 6 | 6 | 984.8 | SE | SE, 8 | NW | NW, 10 | SE-NW. |
| Cold Harbor, Am. S. S. | Glasgow | do | 54 35 N. | 24 16 W. | 8 | 8a, 8 | 9 | 965.4 | N | N, 9 | NNW | WNW, 10 | NE-NNW. |
| Seanmail, Am. S. S. | Bergen | do | 57 15 N. | 30 05 W. | 8 | 8p, 8 | 9 | 998.6 | NW | NW, 8 | NW | NW, 9 | NE-WNW. |
| Lafayette, Am. S. S. | Mobile | Liverpool | [1] 43 13 N. | 45 25 W. | 12 | 4a, 12 | 14 | 1,005.1 | WNW | WSW, 6 | NNW | WNW, 9 | SSW-WNW. |
| Colytto, Du. S. S. | Baltimore | Rotterdam | 44 25 N. | 42 24 W. | 12 | 6a, 12 | 14 | 996.9 | WSW | WSW, 5 | NNW | NW, 9 | WSW-WNW. |
| Cold Harbor, Am. S. S. | Glasgow | New York | 47 31 N. | 45 12 W. | 12 | 8a, 12 | 12 | 998.0 | NNW | WSW, 6 | NW | NNW, 8 | S-NNW. |
| Rosario, Am. S. S. | San Juan | do | 23 23 N. | 67 51 W. | 12 | 4p, 13 | 16 | 1,004.4 | N | NNE, 6 | N | NNE, 8 | None. |
| Permian, Pan. M. S. | Las Piedras | Philadelphia | 22 43 N. | 69 33 W. | 14 | 4p, 14 | 16 | 1,001.7 | N | NW, 5 | N | NW, 7 | None. |
| Borinquen, Am. S. S. | New York | San Juan | 28 00 N. | 65 30 W. | 14 | 2a, 15 | 16 | 999.5 | E | NW, 10 | W | SW, 12 | N-WNW. |
| Ponce, Am. S. S. | San Juan | New York | 32 30 N. | 71 45 W. | 15 | 4a, 15 | 15 | 1,007.8 | NNE | NNE, 6 | NE | NNE, 8 | Steady. |
| F. W. Abrams, Am. S. S. | Halifax | Cartagena | 26 36 N. | 66 48 W. | 15 | 8a, 15 | 15 | 941.4 | E | E, 12 | WSW | E, 12 | |
| Colytto, Du. S. S. | Baltimore | Rotterdam | 47 19 N. | 29 42 W. | 14 | Noon, 15 | 15 | 1,007.5 | WNW | NNW, 8 | NNW | N, 9 | NNW-N. |
| Telamon, Du. S. S. | New York | La Guaira | 29 18 N. | 69 00 W. | 14 | do | 15 | 998.0 | ENE | NE, 10 | NNW | NE, 10 | NE-N. |
| Bacchus, Du. S. S. | do | Guanta, Venez. | 30 12 N. | 68 00 W. | 15 | 5p, 15 | 16 | 993.9 | NE | NE, 12 | N | NE, 12 | NE-NNE. |
| American Shipper, Am. S. S. | Belfast | Boston | [1] 50 12 N. | 43 00 W. | 15 | 8a, 16 | 17 | 994.2 | SE | WSW, 9 | WSW | W, 10 | SW-W. |
| Hermes, Du. S. S. | Faro, Portugal | Philadelphia | 36 22 N. | 66 55 W. | 16 | 12p, 16 | 17 | 1,003.0 | ENE | N, 7 | NNW | ENE, 9 | ENE-NNW. |
| Palembang, Du. S. S. | Capetown | Boston | 35 24 N. | 58 21 W. | 16 | 3a, 17 | 17 | 991.6 | SE | SSE, 10 | W | SW, 11 | SE-SSW. |
| Ulysses, Du. S. S. | Lisbon | Norfolk | 36 37 N. | 60 02 W. | 16 | 6a, 17 | 17 | 996.8 | ENE | SSW, 11 | W | W, 12 | SSE-WSW. |
| Indier, Belg. S. S. | Antwerp | New York | 41 34 N. | 61 12 W. | 17 | Noon, 17 | 17 | 998.8 | NE | N, 12 | NW | N, 12 | NE-N. |
| Examiner, Am. S. S. | Seville | do | 37 56 N. | 55 11 W. | 17 | 4p, 17 | 17 | 1,001.7 | S | S, 10 | WSW | S, 10 | S-WSW. |
| Acadia, Am. S. S. | Cobh | do | [1] 42 12 N. | 50 21 W. | 17 | 4p, 17 | 18 | 961.7 | ESE | NW, 12 | NW | NW, 12 | SE-NE-NW. |
| Kasongo, Belg. S. S. | Antwerp | do | 45 35 N. | 47 30 W. | 17 | 4a, 18 | 18 | [2] 953.4 | SSE | S | W | S, 12 | S-WSW. |
| American Shipper, Am. S. S. | Belfast | Boston | 47 55 N. | 50 59 W. | 17 | 4a, 18 | 18 | 953.3 | E | S, 11 | WNW | SSW, 12 | SE-SSW. |
| Kalani, Am. S. S. | New Orleans | Cristobal | 25 35 N. | 87 00 W. | 18 | 6a, 18 | 18 | 1,014.2 | ENE | ENE, 8 | ENE | ENE, 8 | E-ENE. |
| Salabangka, Du. S. S. | Halifax | Boston | 42 36 N. | 69 18 W. | 19 | 9p, 19 | 21 | 1,014.9 | SW | SW, 7 | SW | SW, 8 | None. |
| Ponce, Am. S. S. | New York | San Juan | 35 45 N. | 72 00 W. | 22 | 8p, 22 | 22 | 1,001.0 | NNW | NNW, 8 | W | NNW, 8 | NNW-WSW. |
| Rotterdam, Du. S. S. | Rotterdam | New York | [1] 42 22 N. | 57 45 W. | 23 | 1p, 23 | 25 | 985.2 | SE | SSW, 5 | NW | SE, 9 | S-W. |
| Ponce, Am. S. S. | New York | San Juan | 19 00 N. | 66 12 W. | 26 | 8p, 26 | 26 | 1,013.5 | ENE | ENE, 8 | W | ENE, 8 | ENE-Var. |
| William G. Warden, Am. S. S. | Cartagena | Montreal | 40 00 N. | 64 12 W. | 28 | 10p, 28 | 29 | 1,003.7 | SW | SW, 9 | NW | SW, 9 | None. |
| Roanoke, Am. S. S. | Port Arthur | Wilmington, N. C. | 32 40 N. | 78 30 W. | 29 | 3a, 30 | 30 | 1,009.1 | ENE | SSW, 2 | NNW | WNW, 9 | SSE-W. |
| Olancho, Am. S. S. | Santa Marta | Barrios | 16 25 N. | 83 53 W. | 30 | 4p, 30 | 31 | 1,005.1 | SW | SW, 6 | NW | W, 8 | SSW-W. |
| Seatrain New York, Am. S. S. | Havana | New York | [1] 39 16 N. | 74 15 W. | 30 | 10p, 30 | 31 | 1,005.4 | NE | | | NE, 9 | |
| Memphis City, Am. S. S. | New Orleans | Cristobal | 21 20 N. | 84 40 W. | 30 | 4a, 31 | [3] 1 | 1,009.1 | N | N, 7 | NW | NW, 9 | N-NW. |
| Wyoming, U. S. S. | Norfolk | San Juan | 33 42 N. | 73 54 W. | 31 | 1p, 31 | 31 | 995.9 | | S, 10 | WNW | S, 10 | S-NW. |
| Argual, Hond. S. S. | Cortez | Boston | 37 40 N. | 72 10 W. | 31 | 4p, 31 | 31 | 995.3 | SE | SSE, 8 | WNW | W, 8 | S-SSE-NW. |
| **NORTH PACIFIC OCEAN** | | | | | | | | | | | | | |
| Swiftsure Bank Lightship, U. S. | On station | | 48 33 N. | 125 00 W. | 1 | 4p, 1 | 1 | 995.3 | SSE | SSW, 9 | SSE | SSE, 9 | SE-SSW-S. |
| Teiyo Maru, Jap. M. S. | Los Angeles | Tokuyama | [1] 38 50 N. | 157 17 E. | 3 | 9a, 3 | 3 | 998.6 | WSW | WSW, 8 | WNW | WSW, 8 | WSW-WNW. |
| W. H. Berg, Am. S. S. | San Francisco | Vladivostok | 49 40 N. | 176 00 E. | 2 | 7p, 4 | 4 | 984.1 | S | SSE, 10 | SSW | SSE, 10 | SE-SW. |
| Texas, Am. S. S. | Kobe | San Francisco | 46 00 N. | 178 00 E. | 6 | 4a, 7 | 7 | 1,008.5 | WSW | WSW, 7 | W | W, 8 | SW-W. |
| Do | do | do | 46 30 N. | 167 30 W. | 8 | 12p, 8 | 9 | 998.0 | ENE | ENE, 6 | NE | ENE, 8 | ENE-ESE. |
| City of Elwood, Am. M. S. | Honolulu | Manila | 16 40 N. | 138 20 E. | 6 | 2a, 9 | 9 | 992.9 | ENE | W, 8 | SW | W, 9 | NW-SW. |
| Norway Maru, Jap. S. S. | Kobe | Los Angeles | 44 22 N. | 165 53 E. | 12 | 4a, 12 | 13 | 1,003.1 | ESE | E, 7 | N | NE, 8 | E-ENE. |
| Michigan, Am. S. S. | Moji | San Francisco | [1] 40 00 N. | 173 50 W. | 12 | 8p, 13 | 14 | 994.9 | SE | SSE, 7 | SW | SW, 9 | S-SSE-SW. |
| Norway Maru, Jap. S. S. | Kobe | Los Angeles | 40 36 N. | 175 33 E. | 15 | 10p, 15 | 16 | 976.0 | NE | SE, 3 | WSW | W, 12 | NNW-SE-W. |
| Kirisima Maru, Jap. M. S. | Singapore | Kobe | [1] 23 48 N. | 122 09 E. | 15 | 4p, 15 | 16 | 998.2 | N | N, 6 | NW | NW, 7 | |
| Netro, U. S. S. | Balboa | San Diago | 13 39 N | 94 56 W. | 16 | 4a, 16 | 16 | 1,009.8 | NNE | NNE, 7 | NNE | NNE, 8 | W-NNE |
| Swiftsure Bank Lightship, U. S. | On station | | 48 33 N. | 125 00 W. | 16 | 10p, 16 | 17 | 1,004.4 | SE | E, 6 | S | SE, 9 | SE-E-S. |
| Svealand, Swed. M. S. | Yokohoma | Los Angeles | 44 50 N. | 180 00 W. | 18 | 8p, 17 | 18 | 991.6 | W | NE, 4 | NW | WNW, 8 | E-NE-NW. |
| Norway Maru, Jap. S. S. | Kobe | do | 40 30 N. | 165 24 W. | 18 | 4p, 18 | 18 | 1,002.7 | | WSW, 8 | | WSW, 10 | |
| Swiftsure Bank Lightship, U. S. | On station | | 48 33 N. | 125 00 W. | 18 | 9p, 18 | 18 | 1,007.1 | E | S, 6 | SW | SE, 8 | SSE-SW. |
| Arimasan Maru, Jap. M. S. | Yokohoma | Los Angeles | 36 00 N. | 151 18 E. | 24 | 11a, 24 | 24 | 979.9 | SE | SSE, 12 | W | SW, 12 | SE-SW. |
| Swiftsure Bank Lightship, U. S. | On station | | 48 33 N. | 125 00 W. | 25 | 12p, 25 | 26 | 1,000.3 | SSE | S, 6 | S | SE, 8 | ESE-S-NE. |
| Jefferson Myers, Am. S. S. | San Diago | Balboa | 15 06 N. | 93 48 W. | 30 | 6p, 30 | 30 | 1,009.8 | NE | NNW, 5 | NNW | NNW, 7 | NNW-SE. |
| President Van Buren, Am. S. S. | Balboa | Los Angeles | 14 07 N. | 95 26 W. | 30 | 4a, 31 | 31 | 1,013.2 | N | N, 7 | ENE | NE, 9 | N-NE. |

[1] Position approximate. [2] Barometer uncorrected. [3] November.

## NORTH PACIFIC OCEAN, OCTOBER 1939

By WILLIS E. HURD

*Atmospheric pressure.*—Over most of the North Pacific Ocean, as indicated by reports from island and coastal stations, the average barometer was close to normal. Only in the Aleutian region were pressures abnormal to a marked degree. At St. Paul Island, in the Bering Sea, the average barometer, 1,011.6 millibars (29.87 inches), was +8.2 millibars (+0.24 inches) above the normal of October. The Aleutian LOW this month lay over the Gulf of Alaska, with Kodiak having an average barometer of 1,003.1 millibars (29.62 inches) and a departure from normal of only +1.1 millibars (+0.03 inch).

The average North Pacific anticyclone this month extended as a belt from the west coast of the United States southwestward across Midway Island.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, October 1939, at selected stations*

| Stations | Average pressure | Departure from normal | Highest | Date | Lowest | Date |
|---|---|---|---|---|---|---|
| | *Millibars* | *Millibars* | *Millibars* | | *Millibars* | |
| Point Barrow | 1,013.7 | +0.2 | 1,032 | 12, 14 | 989 | 26 |
| Dutch Harbor | 1,010.0 | +5.9 | 1,033 | 22 | 971 | 26 |
| St. Paul | 1,011.6 | +8.2 | 1,029 | 21 | 991 | 29 |
| Kodiak | 1,003.1 | +1.1 | 1,030 | 23 | 982 | 17 |
| Juneau | 1,009.6 | −1.9 | 1,028 | 28 | 972 | 16 |
| Tatoosh Island | 1,016.2 | −0.1 | 1,036 | 11 | 1,001 | 26 |
| San Francisco | 1,016.6 | +0.3 | 1,027 | 27 | 1,006 | 24 |
| Mazatlan | 1,010.4 | +0.2 | 1,012 | 18–20, 26, 27 | 1,006 | 1 |
| Honolulu | 1,015.3 | −0.6 | 1,018 | 31 | 1,010 | 22 |
| Midway Island | 1,018.5 | +1.5 | 1,028 | 29 | 1,006 | 2, 3 |
| Guam | 1,009.5 | −1.0 | 1,012 | 12 | 1,007 | 10, 14 |
| Manila | 1,009.6 | +0.5 | 1,012 | [1] 1–3 | 1,003 | 8 |
| Hong Kong | 1,012.0 | −1.7 | 1,019.3 | 31 | 1,002.0 | 9 |
| Naha | 1,012.7 | +0.2 | 1,020 | 31 | 987 | 15 |
| Titijima | 1,013.7 | +0.8 | 1,019 | 31 | 996 | 22 |
| Petropavlovsk | 1,007.7 | −1.4 | 1,028 | 29 | 990 | 21 |

[1] And on other dates.

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu which are based on 2 observations. Departures are computed from best available normals related to time of observation.

*Extratropical cyclones and gales.*—Ship reports do not indicate October 1939 to have been appreciably stormier than the preceding month in middle and higher latitudes of the North Pacific. In fact, for the great stretch of the ocean lying between 130° and 155° west longitudes, no high winds were reported. Along the immediate coast of the United States, during the prevalence of cyclonic disturbances, the Swiftsure Bank Lightship, in 48°33′ N., 125°00′ W., had southeasterly gales of force 8 to 9 on the 1st, 16th, 18th, and 25th.

In east longitudes few gales due to extratropical causes occurred to the westward of the 170th meridian. These were of force 8 only, occurring on the 3d near 39° N., 157° E.; on the 12th near 44° N., 166° E.; and on the 13th near 30° N., 159° E. The greatest concentration of storminess along the middle and upper steamer routes occurred between about 170° E. and 155° W., scattered as to dates and localities between the 4th and 26th. The heaviest early gale in this region was of force 10, lowest barometer 984.1 millibars (29.06 inches), reported on the 4th by the American steamship *W. H. Berg*, near 50° N., 176° E. The most intense local development noted in connection with any of these storms occurred during the night of the 15th–16th near latitude 41° N., longitude 176° E. Here the Japanese steamship *Norway Maru*, in the center of the cyclone, had a low barometer of 976.0 millibars (28.82 inches) with a light southeasterly wind at 10 p. m. of the 15th, followed at midnight by a west wind of hurricane velocity. No further gales exceeding force 8 or 9 were reported until the 18th, when a westerly gale of force 10, with moderate depression of the barometer, occurred near 41° N., 166° W.

During the 21st to 23d a disturbance of moderate depth lay to the eastward of Midway Island. Local north to northeast gales of force 8 to 9 accompanied it, between latitudes 28°–32° N., longitudes 165°–172° W.

One of the deepest cyclones of the month lay over the Aleutian Islands on the 25th and 26th and crossed into the Gulf of Alaska on the 27th. At Dutch Harbor, on the 26th, pressure fell to 971 millimeters (28.67 inches). The highest wind reported on the 26th, in connection with the cyclone, was of force 9 from the northwest, near 55° N., 169° W.

*Tropical cyclones and gales.*—Elsewhere in this issue of the REVIEW is a report, by the Reverend Bernard F. Doucette, S. J., Weather Bureau, Manila, P. I., of four typhoons which occurred in the Far East during October 1939. The only data that may be added to the report are with reference to the final storm described, that of October 20–23. This typhoon was noted as passing close to the eastward of the Bonin (Ogasawara) Islands on the 23d and then inclining "to the northeast as it moved across the 150th meridian." According to a report received at this office from the Japanese motorship *Arimasan Maru*, the ship was evidently in this typhoon on the 24th. At 11 a. m., local time, she encountered a south-southeast gale of hurricane force, lowest barometer 979.9 millibars (28.94 inches), in 36°00′ N., 151°18′ E. At 2 p. m. the wind on ship was southwest, force 12. The typhoon's identity was lost after the 24th.

In the southeastern Pacific Tropics one cyclone occurred. It appears to have originated not far from 15° N., 106° W., on the afternoon of the 23d and to have moved about due north until it entered the Mexican coast at Cape Corrientes on the 25th. Two ships close to the coast south of the cape, one late on the 24th and the other early on the 25th, had southeast winds of force 7, with little depression of the barometer. Press reports from Mexico, however, indicate the storm to have wrought much damage to several coastal towns, to crops, and to communication lines, with some disruption to shipping. The American steamer *Nevadan* was reported severely battered by the storm off Manzanillo.

*Tehuantepecers.*—The first Tehuantepecer of the season occurred in the Gulf of Tehuantepec on the 16th with a north-northeast gale of force 8. On the 30th a force 7 wind was experienced, and on the 31st a northeaster of force 9.

*Fog.*—There was much less fog reported for the open Pacific than during the previous September, and most of the occurrences were observed during the early part of the month. In American coastal waters, ships reported 12 days each with fog off Washington and Oregon; 18 days, off California; and 2 days, off Lower California.

## TYPHOONS AND DEPRESSIONS OVER THE FAR EAST, OCTOBER 1939

By BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

*Typhoon, October 3–12, 1939.*—As a depression, which very likely formed over the Eastern Caroline Islands, this storm first manifested itself about 500 miles south-southeast of Guam, October 3, and moved west-northwest across the Pacific. It gradually increased to typhoon

strength as it moved over the ocean and threatened both central and northern Luzon. The situation on the afternoon of October 7 showed the center changing its direction to the northwest, a course which brought the typhoon across the Balintang Channel, passing about 30 miles southwest of Basco, Batan Islands, during the early morning hours of October 9. The next 3 days witnessed the typhoon weakening and disappearing over the southern part of the Formosa Channel.

At Basco, Batan Islands, the barometric minimum was experienced at 3 a. m. (Manila time) October 9, the value being 718.1 mm. (957.4 mb.) with east winds, force 12. Calayan, about 70 miles southwest of Basco, had a minimum of 724.8 mm. (966.3 mb.) at 1:40 a. m. October 9, the winds being from the west, force 9. No reports of loss of life were received and there did not seem to be any extensive property damage over Luzon.

The upper winds over Guam from October 1 to 5 backed from the southeast quadrant to the north and then veered to the southeast. Velocities were under 50 k. p. h. except the morning ascent of October 3, when east quadrant winds 45 to 60 k. p. h. appeared above 3,000 m. Over the Philippines, October 5 to 7, there was a southwest quadrant current flowing over Zamboanga and Cebu, which increased to values over 50 k. p. h.; while stations of the countries west of the China Sea, such as Saigon, Indochina, and Bandon, Thailand, did not have velocities over 35 k. p. h. The few reports available from Menado, Celebes Island, show weak variable winds aloft with southwest and west quadrant directions prevailing. It seems from this distribution of velocities that the air from the southwest was drawn toward the center. As the typhoon center crossed the Balintang Channel, the highest velocity reported was 80 k. p. h., the ascents during these days being short and infrequent.

*Typhoon, October 7–13, 1939.*—Very likely forming over the Eastern Caroline Islands, a depression appeared over the Pacific Ocean east-northeast of Guam and moving west-northwest, just as the preceding typhoon was changing its course to the northwest. When the new storm reached the regions about 120 miles northeast of Guam, it had acquired typhoon strength, and its progress across the ocean was along a course which gradually inclined from the west-northwest to the northwest and north. It was central about 350 miles east-southeast of Naha, October 11, apparently weakening. It recurved to the northeast and continued along this course, crossing the 150th meridian on October 13 as an extra-tropical depression, the intensity of which was unknown at the time this article was written.

Before October 11, the existence and intensity of this storm was only suspected. Only the observations from Guam were available, until the arrival of the S. S. *City of Elwood* in Manila, when data from the ship's log became available. This ship, on her way to San Bernardino Strait, first felt the typhoon October 7 and 8, her position being northeast of the center. On October 9, at 2 a. m. (ship's time), the barometric minimum was recorded, 746.0 mm. (994.6 mb.) with west by south winds, force 9, in latitude 16°54′ N., longitude 138°31′ E., her position now being southwest of the center.

Of the few pilot balloon ascents made at Guam from October 6 to 9, only that of the morning of October 7 is significant, when northwest winds, 38 to 53 k. p. h. up to 1,000 m., were reported.

*Typhoon, October 10–18, 1939.*—The morning weather map of October 10 showed the existence of a depression about 300 miles south of Guam, which then moved west-northwest about 200 miles. It intensified to typhoon strength before the next morning and it moved in a southwesterly direction during the morning hours. It seemed to be moving toward the regions south of Yap, but during the night of October 11–12, it changed to the northwest and kept this course across the ocean. When it reached the locality about 150 miles east-by-north of Basco, Batan Islands, it inclined to the north-northeast, moving quite rapidly. It passed close to and northwest of Naha and Oshima, all the time changing its direction toward the northeast and east. October 17 saw the storm weakening as it changed its course to the southeast, passing over the 150th meridian as a low pressure area, apparently of weak intensity.

The S. S. *Erling Brovig*, en route to Hong Kong, was under the influence of this typhoon October 15. The lowest barometer reading, as copied from the ship's log, was 725.7 mm. (967.5 mb.) at 7 p. m. (ship's time) in latitude 23°31′ N., longitude 125°56′ E. The winds were from the south-southwest, force 5. Before this, the ship had experienced east winds, force 10, and when the barometer was rising, southwest and west-southwest winds of force 10 to 12 were experienced. The morning observations, October 16, received from Naha, Nansei (Loochoo) Islands, showed a pressure of 740.0 mm. (986.6 mb.) with southwest winds of force 11. The afternoon observation of the same day from Oshima gave south-southwest winds of force 6 with lowest pressure at 739.0 mm. (985.3 mb.). A news dispatch from Japan, dated October 18, stated that 33 lives were lost due to this typhoon.

On October 10, the upper winds over Guam were from the east, with velocities from 44 to 71 k. p. h., up to 1,000 m., a very good indication of development around the center then south of the station. As the center moved over the ocean toward Formosa, being over 500 miles from the southern part of the Philippines, the southwesterly current over Zamboanga and Cebu was weak, Cebu reporting 60 k. p. h. at one level on the morning of the 15th, with the values reported at other times varying between 10 and 40 k. p. h. The few reports received from Menado, Celebes Island, showed weak variable winds, with east and southeast quadrant winds prevailing aloft, certainly indicating little danger for the Philippines.

*Typhoon, October 20–23, 1939.*—This storm first appeared as a vague low-pressure area which moved northwest to the ocean regions north-northwest of Guam, probably forming southeast of Guam. It became a depression, central about 300 miles northwest of Guam on the morning of October 21, and seemed to increase in intensity as it moved about 200 miles northeast of that locality. The next morning (22d) there was no doubt but that it was a typhoon, located about 200 miles south of the Bonins and moving in a northerly direction. It passed close to and east of the Bonins, according to available information, and then inclined to the northeast as it moved across the 150th meridian.

The lowest barometer reading at the Bonins (only synoptic data being available) was 747.0 mm. (995.9 mb.) on the morning of October 23, the winds being west, force 3. At Guam, the upper winds were weak, changing from the southwest and west quadrants to the southeast quadrant on October 21.

# CLIMATOLOGICAL TABLES

## CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

TABLE 1.—*Condensed climatological summary of temperature and precipitation by sections, October 1939*

[For description of tables and charts, see REVIEW, January, p. 31]

| Section | Temperature | | | | | | | | Precipitation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Monthly extremes | | | | | | | | Greatest monthly | | Least monthly | |
| | Section average | Departure from the normal | Station | Highest | Date | Station | Lowest | Date | Section average | Departure from the normal | Station | Amount | Station | Amount |
| | °F. | °F. | | °F. | | | °F. | | In. | In. | | In. | | In. |
| Alabama | 66.9 | +2.2 | Centerville | 94 | 7 | Florence | 26 | 29 | 0.38 | −2.64 | Addison | 1.61 | 7 stations | 0.00 |
| Arizona | 60.2 | −1.4 | Gila Bend | 98 | 1 | Springerville | 16 | | .42 | −.41 | Cochise Stronghold | 2.67 | 16 stations | .00 |
| Arkansas | 65.4 | +2.7 | Conway | 98 | 23 | 2 stations | 20 | 31 | 1.71 | −1.42 | Eureka Springs | 8.48 | Plantersville | .00 |
| California | 60.1 | −.3 | 2 stations | 105 | [1] 12 | Tamarack | −1 | 25 | 1.07 | −.16 | Scales | 5.46 | 13 stations | .00 |
| Colorado | 47.9 | +1.1 | Holyoke | 93 | 6 | Fraser | −4 | 30 | .59 | −.56 | Sunbeam (near) | 2.31 | 5 stations | .00 |
| Florida | 74.6 | +1.6 | 2 stations | 95 | [1] 1 | Mason | 33 | [1] 29 | 2.99 | −1.26 | Homestead | 16.79 | do | .00 |
| Georgia | 66.9 | +2.0 | do | 95 | [1] 7 | Blairsville | 22 | 16 | .33 | −2.40 | Carlton Bridge | 1.92 | 3 stations | .00 |
| Idaho | 47.4 | +.3 | Emmett | 85 | 16 | 2 stations | 6 | 27 | 1.40 | −.08 | Deception Creek | 3.91 | Challis | .24 |
| Illinois | 58.0 | +2.4 | 3 stations | 96 | [1] 7 | Quincy | 22 | 31 | 2.16 | −.42 | Sycamore | 4.89 | Carlyle | .47 |
| Indiana | 57.6 | +2.8 | Madison | 100 | 8 | 2 stations | 20 | 15 | 2.73 | −.04 | Winamac | 5.27 | Salem | .77 |
| Iowa | 53.4 | +1.8 | 5 stations | 95 | 7 | do | 14 | 28 | 1.48 | −.85 | Dubuque | 4.19 | Sioux City | .26 |
| Kansas | 61.1 | +3.9 | Wellington | 101 | 6 | Oberlin | 18 | 28 | .60 | −1.30 | Columbus | 2.89 | 6 stations | .00 |
| Kentucky | 60.9 | +2.7 | Frankfort | 95 | 8 | Mammoth Cave | 23 | 29 | 2.11 | −.59 | Mammoth Cave | 4.37 | Middlesboro | .80 |
| Louisiana | 69.7 | +1.3 | Calhoun | 98 | 22 | Tallulah | 28 | 31 | 2.15 | −1.15 | Melville | 8.82 | Lake Arthur (near) | .16 |
| Maryland-Delaware | 57.2 | +1.1 | Great Falls, Md | 94 | 9 | Oakland, Md | 15 | 15 | 4.80 | +1.78 | Oxford, Md | 7.02 | Mount Savage Summit, Md. | 1.57 |
| Michigan | 48.6 | +.1 | 2 stations | 93 | [1] 8 | Garnet | 11 | 29 | 2.57 | −.28 | Eau Claire (near) | 4.71 | Channing | .57 |
| Minnesota | 44.8 | −1.5 | Beardsley | 88 | 6 | Park Rapids | 7 | 28 | 1.62 | −.22 | Red Lake Falls | 3.42 | Wheaton | .57 |
| Mississippi | 67.1 | +1.7 | Tupelo | 95 | 7 | 2 stations | 25 | 29 | 1.17 | −1.43 | Brookhaven | 4.90 | 2 stations | T |
| Missouri | 61.1 | +3.6 | Edgerton | 100 | 7 | Edgerton | 19 | 31 | 1.80 | −.97 | Williamsville | 6.98 | Oregon | .13 |
| Montana | 45.2 | +.3 | 2 stations | 82 | [1] 1 | Simpson (near) | −13 | 26 | .87 | −.20 | Hebgen Dam | 2.35 | Malta | .01 |
| Nebraska | 53.6 | +2.0 | Falls City | 94 | 7 | Ewing | 15 | 28 | .68 | −.79 | Ashland | 2.61 | 4 stations | .00 |
| Nevada | 51.1 | +.6 | Overton | 91 | 1 | Mala Vista Ranch | 9 | 26 | 1.08 | +.51 | Marlette Lake | 2.88 | 3 stations | .00 |
| New England | 49.5 | .0 | 2 stations | 91 | 10 | Chelsea, Vt | 10 | 25 | 4.68 | +1.13 | Houlton, Maine | 6.64 | New Durham, N. H. | 1.70 |
| New Jersey | 54.9 | +.2 | Elizabeth | 93 | 10 | 2 stations | 19 | [1] 16 | 4.24 | +.83 | Toms River | 5.79 | Long Valley | 2.08 |
| New Mexico | 52.9 | −.8 | Carlsbad | 95 | 6 | Eagle Nest | 7 | 31 | .91 | −.22 | Cliff | 3.31 | 3 stations | .00 |
| New York | 50.0 | .0 | Searsdale | 91 | 10 | Delhi | 11 | 18 | 3.52 | +.22 | Bridgehampton | 5.87 | Brockport | 1.30 |
| North Carolina | 62.6 | +2.7 | 6 stations | 95 | [1] 9 | Banner Elk | 16 | 15 | 2.19 | −1.16 | New Holland | 7.22 | 2 stations | .26 |
| North Dakota | 41.3 | −2.5 | Oakes | 84 | 1 | Parshall | −6 | 28 | .75 | −.26 | Casselton | 2.36 | Berthold Agency | T |
| Ohio | 56.1 | +2.6 | Germantown | 98 | 9 | 2 stations | 19 | [1] 15 | 3.00 | +.46 | Bellpoint | 5.12 | Peebles | 1.45 |
| Oklahoma | 66.0 | +4.1 | Alva | 101 | 6 | Boise City | 19 | 30 | 1.70 | −1.21 | Watts | 6.40 | Boise City | T |
| Oregon | 49.8 | +.1 | Spray | 91 | 12 | 2 stations | 8 | [1] 7 | 2.02 | +.12 | Valsetz | 9.03 | Big Eddy | .08 |
| Pennsylvania | 53.6 | +1.0 | Phoenixville | 92 | 10 | Mount Pocono | 15 | 18 | 3.88 | +.64 | Graterford | 6.69 | Kylertown | 2.38 |
| South Carolina | 66.6 | +2.8 | 2 stations | 96 | [1] 8 | 2 stations | 27 | 16 | .81 | −2.23 | Sumter | 2.84 | Columbia | .04 |
| South Dakota | 48.6 | +.1 | 3 stations | 90 | 6 | Gelhaus Farm | 7 | 28 | 1.13 | −.03 | 2 stations | 2.08 | La Delle | .42 |
| Tennessee | 62.9 | +3.2 | do | 95 | [1] 8 | Coldwater | 21 | 29 | 1.25 | −1.59 | Celina | 3.88 | Chattanooga | .25 |
| Texas | 69.3 | +1.8 | Bonham | 103 | 23 | 2 stations | 22 | 30 | 1.42 | −1.34 | Junction | 5.73 | Yoakum | .05 |
| Utah | 49.5 | +.5 | Fruita | 85 | 9 | do | 12 | [1] 26 | 1.25 | +.15 | Silver Lake | 3.04 | Hanksville | T |
| Virginia | 58.8 | +1.5 | Diamond Springs | 95 | 10 | do | 16 | [1] 16 | 3.17 | +.16 | Hopewell | 7.33 | Moores Creek Dam | .37 |
| Washington | 50.1 | +.6 | Castlerock | 88 | 16 | Soda Springs Camp | 14 | 25 | 2.59 | −.50 | Clearwater | 12.44 | Naches Heights | .63 |
| West Virginia | 55.9 | +1.3 | 5 stations | 92 | [1] 8 | Beckley | 14 | 15 | 3.24 | +.38 | Martinsburg | 5.58 | Kanawha Falls | .85 |
| Wisconsin | 48.2 | .0 | Brodhead | 88 | 7 | 3 stations | 10 | 17 | 1.86 | −.59 | West Bend | 3.75 | Ladysmith | 1.01 |
| Wyoming | 44.8 | +1.2 | Yoder | 88 | [1] 1 | Jenkins Ranch | 4 | 27 | .80 | −.28 | Snake River | 2.22 | Basin | .00 |
| Alaska (September) | 43.9 | +.1 | 3 stations | 70 | [1] 1 | Wiseman | −2 | 18 | 4.49 | +.97 | Yakutat | 20.58 | Fort Yukon | .47 |
| Hawaii | 73.6 | −.1 | Mana | 92 | 6 | Kanalohuluhulu | 45 | 3 | 8.61 | +3.28 | Wahiawa Water Intake Co. | 30.00 | Wahukona | .00 |
| Puerto Rico | 78.6 | +.4 | Ponce | 97 | 9 | Garzas | 57 | 30 | 8.40 | +.66 | Jayuya | 15.16 | Playa Grande (Vieques). | 2.25 |

[1] Other dates also.

TABLE 2.—*Climatological data for Weather Bureau Stations, October, 1939*

| District and station | Elevation of instruments: Barometer above sea level | Elevation of instruments: Thermometer above ground | Elevation of instruments: Anemometer above ground | Pressure: Station, reduced to mean of 24 hours | Pressure: Sea level, reduced to mean of 24 hours | Pressure: Departure from normal | Temperature of the air: Mean max. + mean min. ÷ 2 | Temperature of the air: Departure from normal | Temperature of the air: Maximum | Temperature of the air: Date | Temperature of the air: Mean maximum | Temperature of the air: Minimum | Temperature of the air: Date | Temperature of the air: Mean minimum | Temperature of the air: Greatest daily range | Mean wet thermometer | Mean temperature of the dew-point | Mean relative humidity | Precipitation: Total | Precipitation: Departure from normal | Precipitation: Days with 0.01 inch, or more | Wind: Average hourly velocity | Wind: Prevailing direction | Wind: Maximum velocity: Miles per hour | Wind: Maximum velocity: Direction | Wind: Maximum velocity: Date | Clear days | Partly cloudy days | Cloudy days | Average cloudiness, tenths | Total snowfall | Snow, sleet, and ice on ground at end of month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Ft.* | *Ft.* | *Ft.* | *In.* | *In.* | *In.* | °*F.* | °*F.* | °*F.* | | °*F.* | °*F.* | | °*F.* | °*F.* | °*F.* | °*F.* | % | *In.* | *In.* | | *Miles* | | | | | | | | 0–10 | *In.* | *In.* |
| *New England* | | | | | | | 51.4 | +0.3 | | | | | | | | | | 78 | 3.93 | +0.6 | | | | | | | | | | 5.9 | | |
| Eastport | 76 | 67 | 85 | 29.88 | 29.96 | −0.04 | 47.7 | +0.2 | 68 | 5 | 54 | 30 | 18 | 42 | 22 | 45 | 43 | 85 | 3.96 | +0.4 | 16 | 11.3 | nw. | 41 | s. | 31 | 7 | 5 | 19 | 6.9 | T | 0.0 |
| Greenville, Maine | 1,069 | 4 | 41 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Portland, Maine | 103 | 82 | 117 | 29.87 | 29.99 | −.05 | 49.8 | −.1 | 72 | 10 | 58 | 29 | 24 | 42 | 26 | 45 | 40 | 72 | 3.34 | −.2 | 10 | 8.5 | n. | 27 | nw. | 24 | 11 | 12 | 8 | 4.8 | T | .0 |
| Concord | 288 | 54 | 72 | 29.69 | 30.01 | −.04 | 49.6 | −.1 | 86 | 10 | 60 | 22 | 30 | 39 | 37 | | | | 2.77 | −.1 | 12 | 6.0 | nw. | 25 | w. | 28 | 10 | 7 | 14 | 6.1 | T | .0 |
| Burlington | 403 | 11 | 48 | 29.54 | 29.98 | −.06 | 47.6 | −1.6 | 77 | 10 | 56 | 23 | 25 | 39 | 38 | 43 | 39 | 75 | 2.19 | −.8 | 11 | 10.2 | s. | 34 | s. | 19 | 5 | 7 | 19 | 7.0 | T | .0 |
| Northfield | 876 | 12 | 60 | 29.05 | 30.01 | −.03 | 45.4 | −.1 | 82 | 10 | 56 | 18 | 25 | 35 | 42 | 41 | 38 | 80 | 2.94 | +.1 | 11 | 8.0 | sw. | 27 | s. | 21 | 4 | 8 | 19 | 7.2 | T | .0 |
| Boston [1] | 29 | 33 | 62 | 29.96 | 29.99 | −.06 | 54.2 | +.6 | 87 | 10 | 63 | 31 | 24 | 45 | 30 | 47 | 42 | 69 | 4.77 | +1.6 | 12 | 11.5 | nw. | 37 | ne. | 3 | 9 | 8 | 14 | 5.9 | .0 | .0 |
| Nantucket | 12 | 14 | 90 | 29.99 | 30.00 | −.05 | 55.2 | +1.0 | 76 | 11 | 62 | 35 | 18 | 49 | 23 | 52 | 49 | 83 | 4.56 | +1.2 | 12 | 15.5 | sw. | 39 | ne. | 2 | 9 | 9 | 13 | 5.9 | .0 | .0 |
| Block Island | 26 | 11 | 46 | 29.98 | 30.01 | −.04 | 54.8 | −.1 | 73 | 9 | 61 | 34 | 18 | 48 | 23 | 51 | 47 | 77 | 4.27 | +.7 | 11 | 17.3 | sw. | 45 | nw. | 28 | 13 | 7 | 11 | 4.8 | .0 | .0 |
| Providence | 159 | 215 | 251 | 29.95 | 30.02 | −.03 | 53.7 | +1.5 | 86 | 10 | 63 | 30 | 18 | 45 | 29 | 48 | 45 | 82 | 4.31 | +1.2 | 11 | 11.6 | nw. | 38 | nw. | 23 | 11 | 8 | 12 | 5.3 | .0 | .0 |
| Hartford | 159 | 66 | 100 | 29.97 | 30.01 | −.05 | 53.0 | +1.8 | 89 | 10 | 63 | 29 | 18 | 43 | 34 | 46 | 42 | 80 | 4.64 | +1.1 | 11 | 8.5 | s. | 28 | w. | 23 | 9 | 9 | 13 | 5.8 | .0 | .0 |
| New Haven | 106 | 74 | 153 | 30.01 | 30.03 | −.03 | 54.1 | +.3 | 87 | 10 | 63 | 31 | 18 | 46 | 31 | 49 | 45 | 77 | 5.46 | +1.8 | 13 | 9.0 | n. | 25 | n. | 30 | 11 | 9 | 11 | 5.5 | .0 | .0 |
| *Middle Atlantic States* | | | | | | | 57.3 | +0.8 | | | | | | | | | | 75 | 3.87 | +0.8 | | | | | | | | | | 5.4 | | |
| Albany [1] | 292 | 26 | 40 | 29.68 | 30.01 | −.05 | 49.0 | −3.1 | 89 | 10 | 59 | 22 | 25 | 39 | 38 | 44 | 40 | 76 | 3.22 | +.5 | 13 | 9.4 | s. | 35 | nw. | 28 | 8 | 10 | 13 | 6.2 | T | .0 |
| Binghamton | 871 | 57 | 79 | 29.11 | 30.04 | −.02 | 51.2 | +1.2 | 87 | 10 | 61 | 26 | 25 | 41 | 36 | 45 | 41 | 75 | 3.02 | .0 | 18 | 6.2 | nw. | 28 | nw. | 28 | 4 | 11 | 16 | 6.9 | T | .0 |
| New York | 314 | 415 | 454 | 29.68 | 30.02 | −.04 | 56.4 | +.1 | 86 | 10 | 64 | 33 | 18 | 48 | 28 | 50 | 45 | 69 | 3.96 | +.4 | 11 | 14.4 | nw. | 53 | nw. | 28 | 9 | 10 | 12 | 5.7 | .0 | .0 |
| Harrisburg [1] | 351 | 30 | 49 | 29.68 | 30.06 | −.02 | 55.7 | +.9 | 89 | 10 | 66 | 30 | 16 | 46 | 37 | 49 | 44 | 74 | 3.88 | +1.0 | 10 | 7.1 | w. | 31 | nw. | 28 | 12 | 4 | 15 | 5.9 | T | .0 |
| Philadelphia | 114 | 174 | 367 | 29.92 | 30.05 | −.02 | 57.6 | −.2 | 90 | 10 | 66 | 36 | 18 | 50 | 27 | 51 | 46 | 71 | 4.30 | +1.5 | 8 | 12.0 | sw. | 34 | nw. | 28 | 10 | 9 | 12 | 5.5 | .0 | .0 |
| Reading | 323 | 283 | 306 | 29.71 | 30.06 | | 56.0 | +1.3 | 88 | 10 | 65 | 33 | 30 | 47 | 32 | 49 | 43 | 68 | 4.03 | +.9 | 9 | 10.0 | nw. | 42 | nw. | 28 | 12 | 8 | 11 | 5.2 | .0 | .0 |
| Scranton | 805 | 72 | 104 | 29.17 | 30.04 | −.03 | 51.7 | −.2 | 86 | 10 | 61 | 28 | 18 | 42 | 33 | 46 | 42 | 75 | 3.11 | +.1 | 13 | 6.5 | sw. | 34 | nw. | 28 | 9 | 8 | 14 | 6.2 | T | .0 |
| Atlantic City | 52 | 37 | 172 | 29.98 | 30.03 | −.04 | 58.6 | +1.7 | 87 | 9 | 66 | 33 | 18 | 51 | 28 | 54 | 50 | 78 | 5.11 | +1.9 | 10 | 15.0 | w. | 53 | ne. | 2 | 11 | 9 | 11 | 5.3 | .0 | .0 |
| Sandy Hook | 22 | 10 | 57 | 30.00 | 30.02 | | 56.8 | −.1 | 84 | 10 | 64 | 37 | 18 | 50 | 24 | 52 | 47 | 76 | 4.50 | +.7 | 10 | 14.2 | sw. | 41 | nw. | 28 | 11 | 9 | 11 | 5.1 | .0 | .0 |
| Trenton | 190 | 89 | 107 | 29.84 | 30.04 | | 55.6 | .0 | 89 | 10 | 65 | 34 | 18 | 46 | 31 | 50 | 45 | 74 | 2.85 | +.1 | 9 | 8.1 | n. | 31 | nw. | 28 | 8 | 11 | 12 | 5.7 | .0 | .0 |
| Baltimore [2] | 123 | 100 | 215 | 30.04 | 30.06 | −.02 | 59.6 | +1.4 | 93 | 10 | 68 | 37 | 29 | 51 | 29 | 52 | 48 | 77 | 4.01 | +1.1 | 7 | 9.4 | sw. | 38 | nw. | 28 | 12 | 9 | 10 | 5.2 | .0 | .0 |
| Washington | 112 | 62 | 85 | 29.94 | 30.06 | −.02 | 58.4 | +1.0 | 92 | 10 | 68 | 35 | 16 | 49 | 34 | 52 | 47 | 75 | 4.06 | +1.2 | 9 | 5.6 | nw. | 27 | nw. | 28 | 10 | 10 | 11 | 5.2 | .0 | .0 |
| Cape Henry | 18 | 8 | 54 | 30.03 | 30.05 | | 65.0 | +2.9 | 93 | 10 | 72 | 45 | 17 | 58 | 29 | 59 | 56 | 80 | 6.68 | +3.7 | 8 | 13.1 | sw. | 40 | n. | 28 | 15 | 6 | 10 | 4.7 | .0 | .0 |
| Lynchburg | 686 | 144 | 184 | 29.37 | 30.10 | +.01 | 60.2 | +1.7 | 92 | 9 | 72 | 31 | 16 | 48 | 39 | 52 | 48 | 74 | 2.73 | +.4 | 8 | 6.1 | w. | 31 | nw. | 28 | 16 | 6 | 9 | 4.8 | .0 | .0 |
| Norfolk | 91 | 80 | 125 | 29.97 | 30.07 | .00 | 64.3 | +1.8 | 92 | 10 | 72 | 44 | 29 | 56 | 29 | 57 | 54 | 77 | 5.04 | +2.0 | 7 | 9.4 | sw. | 26 | n. | 28 | 12 | 8 | 11 | 5.4 | .0 | .0 |
| Richmond [2] | 144 | 11 | 52 | 29.89 | 30.07 | −.01 | 60.6 | +1.0 | 92 | 9 | 71 | 35 | 16 | 50 | 36 | 53 | 51 | 85 | 4.33 | +1.4 | 7 | 7.3 | sw. | 24 | nw. | 28 | 15 | 8 | 8 | 4.3 | .0 | .0 |
| Wytheville | 2,304 | 49 | 55 | 27.70 | 30.11 | +.02 | 56.6 | +3.0 | 84 | 9 | 69 | 25 | 16 | 44 | 43 | 48 | 43 | 71 | 1.00 | −1.8 | 8 | 6.1 | w. | 24 | nw. | 28 | 15 | 9 | 7 | 4.2 | .0 | .0 |
| *South Atlantic States* | | | | | | | 67.1 | +2.8 | | | | | | | | | | 78 | 1.91 | −1.3 | | | | | | | | | | 4.5 | | |
| Asheville | 2,253 | 89 | 104 | 27.78 | 30.13 | +.04 | 59.6 | +4.3 | 85 | 10 | 73 | 29 | 16 | 46 | 41 | 50 | 46 | 73 | .82 | −1.9 | 4 | 6.6 | nw. | 26 | nw. | 28 | 14 | 12 | 5 | 4.3 | .0 | .0 |
| Charlotte [2] | 779 | 63 | 86 | 29.26 | 30.08 | .00 | 65.5 | +3.8 | 92 | 9 | 77 | 35 | 16 | 54 | 34 | 55 | 51 | 74 | 1.09 | −1.9 | 4 | 6.7 | ne. | 21 | sw. | 27 | 16 | 9 | 6 | 4.3 | .0 | .0 |
| Greensboro [1] | 886 | 6 | 56 | 29.15 | 30.10 | | 61.2 | | 91 | 9 | 74 | 29 | 16 | 48 | 43 | 53 | 50 | 80 | 2.12 | | 5 | 7.5 | sw. | 25 | nw. | 28 | 14 | 8 | 9 | 4.3 | .0 | .0 |
| Hatteras | 11 | 5 | 50 | 30.04 | 30.05 | −.01 | 68.8 | +2.9 | 84 | 1 | 75 | 53 | 29 | 63 | 21 | 63 | 61 | 82 | 5.72 | +.8 | 10 | 13.0 | sw. | 40 | nw. | 31 | 12 | 9 | 10 | 5.1 | .0 | .0 |
| Raleigh [2] | 376 | 103 | 146 | 29.70 | 30.08 | +.01 | 63.6 | +1.6 | 92 | 9 | 74 | 37 | 16 | 53 | 32 | 55 | 53 | 81 | 3.02 | +.2 | 7 | 8.1 | sw. | 27 | nw. | 28 | 11 | 12 | 8 | 5.0 | .0 | .0 |
| Wilmington | 72 | 73 | 107 | 29.99 | 30.07 | +.01 | 66.8 | +1.5 | 87 | 9 | 76 | 42 | 17 | 57 | 34 | 60 | 58 | 82 | 3.00 | −.3 | 4 | 8.6 | n. | 22 | sw. | 28 | 11 | 9 | 11 | 4.9 | .0 | .0 |
| Charleston [2] | 48 | 11 | 92 | 30.02 | 30.07 | +.01 | 69.4 | +1.6 | 87 | 22 | 78 | 48 | 17 | 61 | 25 | 60 | 58 | 87 | .89 | −2.4 | 2 | 9.8 | n. | 26 | n. | 14 | 14 | 8 | 9 | 4.5 | .0 | .0 |
| Columbia, S. C. | 347 | 70 | 91 | 29.71 | 30.09 | +.02 | 68.4 | +4.1 | 92 | 9 | 79 | 41 | 16 | 57 | 38 | 58 | 52 | 65 | .04 | −2.5 | 1 | 7.5 | ne. | 24 | sw. | 22 | 16 | 8 | 7 | 4.0 | .0 | .0 |
| Greenville, S. C. | 1,040 | 70 | 78 | 28.99 | 30.08 | | 64.9 | +4.7 | 90 | 9 | 76 | 37 | 29 | 53 | 36 | 55 | 49 | 66 | 1.14 | −2.0 | 4 | 6.1 | sw. | 24 | sw. | 27 | 14 | 13 | 4 | 3.8 | .0 | .0 |
| Augusta [2] | 182 | 62 | 77 | 29.62 | 30.07 | .00 | 68.3 | +3.0 | 91 | 8 | 80 | 39 | 17 | 57 | 40 | 58 | 53 | 70 | .14 | −2.3 | 3 | 4.9 | nw. | 19 | ne. | 29 | 15 | 9 | 7 | 4.3 | .0 | .0 |
| Savannah [2] | 65 | 73 | 152 | 30.01 | 30.06 | +.01 | 71.0 | +3.1 | 91 | 12 | 81 | 45 | 17 | 61 | 33 | 61 | 60 | 87 | 1.10 | −1.9 | 4 | 8.7 | ne. | 26 | w. | 31 | 18 | 6 | 7 | 3.8 | .0 | .0 |
| Jacksonville | 43 | 86 | 110 | 30.00 | 30.05 | +.03 | 71.8 | +.7 | 88 | 27 | 80 | 48 | 31 | 63 | 28 | 66 | 64 | 84 | 4.06 | −.4 | 5 | 7.4 | ne. | 26 | ne. | 15 | 11 | 7 | 13 | 5.6 | .0 | .0 |
| *Florida Peninsula* | | | | | | | 78.8 | +2.0 | | | | | | | | | | 82 | 9.54 | +3.7 | | | | | | | | | | 5.3 | | |
| Key West [2] | 21 | 10 | 64 | 29.94 | 29.95 | +.01 | 80.2 | +1.1 | 91 | 1 | 86 | 68 | 31 | 75 | 16 | 75 | 74 | 82 | 11.82 | +5.8 | 19 | 9.2 | e. | 32 | nw. | 31 | 9 | 16 | 6 | 5.5 | .0 | .0 |
| Miami | 25 | 124 | 168 | 29.94 | 29.98 | +.01 | 79.6 | +2.6 | 90 | 2 | 85 | 58 | 31 | 74 | 20 | 73 | 71 | 78 | 14.42 | +6.0 | 14 | 8.8 | ne. | 31 | ne. | 4 | 9 | 14 | 8 | 5.4 | .0 | .0 |
| Tampa [2] | 35 | 88 | 197 | 30.00 | 30.01 | +.03 | 76.6 | +2.3 | 90 | 3 | 84 | 52 | 31 | 69 | 21 | 70 | 68 | 85 | 2.38 | −.7 | 6 | 10.2 | ne. | 32 | n. | 31 | 13 | 7 | 11 | 4.9 | .0 | .0 |
| *East Gulf States* | | | | | | | 68.4 | +1.6 | | | | | | | | | | 76 | 0.34 | −2.6 | | | | | | | | | | 3.7 | | |
| Atlanta [1] | 976 | 5 | 72 | 29.06 | 30.08 | +.01 | 64.7 | +1.7 | 89 | 8 | 77 | 36 | 31 | 52 | 34 | 56 | 51 | 74 | .12 | | 3 | 7.8 | nw. | 32 | nw. | 31 | 14 | 10 | 7 | 4.1 | .0 | .0 |
| Macon [2] | 370 | 79 | 87 | 29.58 | 30.07 | +.01 | 66.4 | +1.9 | 91 | 8 | 78 | 37 | 17 | 54 | 41 | 58 | 53 | 74 | T | −2.3 | 0 | 5.7 | n. | 24 | nw. | 31 | 8 | 15 | 8 | 4.9 | .0 | .0 |
| Thomasville | 273 | 49 | 58 | 29.78 | 30.08 | +.04 | 70.0 | +1.8 | 89 | 8 | 81 | 43 | 31 | 59 | 31 | 61 | 58 | | .02 | −2.9 | 1 | | | | | | 21 | 5 | 5 | 3.4 | .0 | .0 |
| Apalachicola | 35 | 11 | 51 | 30.00 | 30.04 | | 71.8 | +1.2 | 88 | 22 | 80 | 47 | 31 | 64 | 23 | 65 | 63 | 80 | .22 | −3.0 | 3 | 8.4 | ne. | 22 | nw. | 31 | 16 | 7 | 8 | 4.3 | .0 | .0 |
| Pensacola | 56 | 149 | 185 | 30.00 | 30.06 | +.03 | 70.4 | +.5 | 87 | 11 | 78 | 43 | 31 | 63 | 26 | 63 | 59 | 72 | .07 | −4.1 | 2 | 10.9 | ne. | 26 | n. | 30 | 19 | 8 | 4 | 3.1 | .0 | .0 |
| Anniston | 741 | 9 | | | | | 64.5 | +2.1 | 85 | 10 | 77 | 31 | 29 | 52 | 37 | | | | .27 | −2.4 | 4 | | se. | | | | 22 | 6 | 3 | | .0 | .0 |
| Birmingham [2] | 630 | 11 | 48 | 29.44 | 30.10 | +.03 | 66.6 | +1.8 | 88 | 9 | 78 | 36 | 29 | 56 | 33 | 55 | 53 | 83 | .17 | −2.2 | 3 | 6.1 | s. | 16 | se. | 24 | 17 | 8 | 6 | 3.4 | .0 | .0 |
| Mobile | 57 | 86 | 161 | 30.01 | 30.07 | +.03 | 70.1 | +.8 | 88 | 23 | 80 | 41 | 31 | 60 | 28 | 62 | 59 | 77 | .13 | −3.5 | 2 | 9.2 | n. | 33 | nw. | 28 | 21 | 7 | 3 | 3.1 | .0 | .0 |
| Montgomery [2] | 218 | 92 | 105 | 29.83 | 30.08 | +.02 | 68.8 | +2.2 | 90 | 8 | 80 | 40 | 29 | 58 | 31 | 57 | 54 | 77 | .24 | −2.2 | 3 | 6.3 | n. | 18 | n. | 28 | 19 | 7 | 5 | 3.3 | .0 | .0 |
| Meridian [2] | 375 | 67 | 92 | 29.76 | 30.09 | +.03 | 67.0 | +2.7 | 90 | 7 | 80 | 35 | 29 | 54 | 37 | 56 | 53 | 83 | .26 | −2.1 | 2 | 5.2 | n. | 17 | n. | 28 | 16 | 7 | 8 | 3.6 | .0 | .0 |
| Vicksburg | 247 | 82 | 102 | 29.82 | 30.08 | +.02 | 68.2 | +1.5 | 91 | 7 | 79 | 37 | 31 | 58 | 29 | 59 | 54 | 70 | 2.15 | −.6 | 4 | 8.2 | n. | 27 | nw. | 27 | 17 | 8 | 6 | 3.8 | .0 | .0 |
| New Orleans [2] | 53 | 76 | 84 | 30.02 | 30.06 | +.03 | 72.5 | +1.5 | 89 | 26 | 80 | 49 | 31 | 65 | 21 | 65 | 61 | 71 | .17 | −3.1 | 2 | 7.1 | ne. | 18 | ne. | 1 | 18 | 8 | 5 | 3.6 | .0 | .0 |
| *West Gulf States* | | | | | | | 71.4 | +2.6 | | | | | | | | | | 68 | 1.36 | −1.7 | | | | | | | | | | 3.8 | | |
| Shreveport [2] | 249 | 92 | 227 | 29.88 | 30.07 | +.02 | 69.2 | +2.6 | 94 | 22 | 81 | 39 | 31 | 57 | 36 | 58 | 53 | 70 | .70 | −2.0 | 6 | 10.9 | s. | 27 | nw. | 30 | 17 | 8 | 6 | 3.7 | .0 | .0 |
| Bentonville | 1,303 | 12 | 51 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fort Smith | 463 | 57 | 82 | 29.59 | 30.07 | +.02 | 67.0 | +4.2 | 94 | 6 | 80 | 33 | 31 | 54 | 36 | 56 | 48 | 59 | 4.09 | +1.1 | 4 | 7.3 | e. | 34 | nw. | 9 | 19 | 8 | 4 | 2.8 | .0 | .0 |
| Little Rock [2] | 357 | 94 | 102 | 29.79 | 30.08 | +.02 | 66.0 | +2.4 | 92 | 23 | 77 | 34 | 31 | 55 | 33 | 56 | 51 | 73 | .66 | −2.0 | 4 | 7.1 | s. | 21 | nw. | 30 | 20 | 5 | 6 | 2.9 | .0 | .0 |
| Austin [2] | 605 | 68 | 90 | 29.39 | 30.04 | | 71.5 | +3.2 | 91 | 6 | 83 | 40 | 31 | 60 | 36 | 61 | 54 | 63 | 1.62 | −1.6 | 6 | 7.2 | s. | 22 | n. | 30 | 14 | 10 | 7 | 4.5 | .0 | .0 |
| Brownsville [2] | 57 | 88 | 96 | 29.98 | 30.00 | | 75.6 | +.7 | 89 | 6 | 83 | 44 | 31 | 68 | 32 | 68 | 65 | 81 | .50 | −2.8 | 4 | 10.5 | se. | 32 | nw. | 30 | 13 | 10 | 8 | 4.5 | .0 | .0 |
| Corpus Christi [2] | 20 | 11 | 78 | 29.97 | 30.02 | +.02 | 75.3 | +2.1 | 90 | 5 | 81 | 51 | 31 | 69 | 24 | 66 | 63 | 79 | 1.14 | −1.3 | 3 | 11.1 | se. | 30 | ne. | 28 | 15 | 10 | 6 | 4.0 | .0 | .0 |
| Dallas [2] | 512 | 220 | 227 | 29.53 | 30.04 | | 70.6 | | 93 | 6 | 81 | 42 | 31 | 60 | 31 | 58 | 51 | 69 | 2.13 | −.6 | 3 | 11.9 | s. | 33 | n. | 29 | 16 | 7 | 8 | 3.7 | .0 | .0 |
| Fort Worth [2] | 679 | 92 | 110 | 29.31 | 30.05 | +.02 | 71.4 | +4.7 | 96 | 6 | 83 | 40 | 31 | 60 | 36 | 58 | 50 | 55 | .55 | −2.3 | 2 | 10.1 | s. | 31 | n. | 30 | 21 | 5 | 5 | 2.5 | .0 | .0 |
| Galveston [2] | 54 | 106 | 114 | 30.04 | 30.05 | +.02 | 73.2 | +.5 | 87 | 10 | 78 | 51 | 31 | 68 | 17 | 65 | 62 | 75 | 2.22 | −2.1 | 6 | 9.9 | s. | 28 | n. | 30 | 17 | 11 | 3 | 3.5 | .0 | .0 |
| Houston [2] | 138 | 157 | 190 | 29.99 | 30.06 | | 72.4 | +2.1 | 90 | 6 | 82 | 44 | 31 | 63 | 28 | 62 | 58 | 76 | 1.64 | −2.1 | 7 | 10.2 | se. | 35 | se. | 20 | 10 | 14 | 7 | 4.6 | .0 | .0 |
| Palestine | 510 | 64 | 72 | 29.54 | 30.08 | +.05 | 70.0 | +2.8 | 93 | 22 | 81 | 39 | 31 | 59 | 33 | 48 | 50 | 57 | 1.37 | −2.0 | 5 | 7.4 | s. | 18 | nw. | 30 | 16 | 11 | 4 | 3.4 | .0 | .0 |
| Port Arthur | 34 | 59 | 134 | 30.02 | 30.06 | | 72.0 | | 88 | 5 | 80 | 42 | 31 | 64 | 25 | 64 | 59 | 73 | .98 | −2.4 | 5 | 12.0 | s. | 33 | n. | 30 | 12 | 14 | 5 | 4.5 | .0 | .0 |
| San Antonio [2] | 693 | 111 | 301 | 29.43 | 30.04 | +.03 | 73.4 | +2.9 | 93 | 8 | 83 | 44 | 31 | 64 | 32 | 63 | 57 | 63 | .07 | −2.2 | 3 | 11.7 | se. | 32 | n. | 30 | 12 | 10 | 9 | 5.2 | .0 | .0 |

**See footnotes at end of table.**

TABLE 2.—*Climatological data for Weather Bureau Stations, October 1939*—Continued

| District and station | Elevation of instruments: Barometer above sea level | Elevation of instruments: Thermometer above ground | Elevation of instruments: Anemometer above ground | Pressure: Station, reduced to mean of 24 hours | Pressure: Sea level, reduced to mean of 24 hours | Pressure: Departure from normal | Temperature of the air: Mean max. +mean min. ÷2 | Temperature of the air: Departure from normal | Temperature of the air: Maximum | Temperature of the air: Date | Temperature of the air: Mean maximum | Temperature of the air: Minimum | Temperature of the air: Date | Temperature of the air: Mean minimum | Temperature of the air: Greatest daily range | Mean wet thermometer | Mean temperature of the dew-point | Mean relative humidity | Precipitation: Total | Precipitation: Departure from normal | Precipitation: Days with 0.01 inch, or more | Wind: Average hourly velocity | Wind: Prevailing direction | Wind: Maximum velocity: Miles per hour | Wind: Maximum velocity: Direction | Wind: Maximum velocity: Date | Clear days | Partly cloudy days | Cloudy days | Average cloudiness, tenths | Total snowfall | Snow, sleet, and ice on ground at end of month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ohio Valley and Tennessee* | *Ft.* | *Ft.* | *Ft.* | *In.* | *In.* | *In.* | *°F.* | *°F.* | *°F.* | | *°F.* | *°F.* | | *°F.* | *°F.* | *°F.* | *°F.* | — | *In.* | *In.* | | *Miles* | | | | | | | | *0–10* | *In.* | *In.* |
| | | | | | | | 60.3 | +2.6 | | | | | | | | | | 69 | 2.25 | −0.5 | | | | | | | | | | 4.1 | | |
| Chattanooga [2] | 762 | 71 | 214 | 29.37 | 30.10 | +0.01 | 66.4 | +4.5 | 92 | 7 | 78 | 38 | 31 | 54 | 37 | 54 | 49 | 70 | .25 | −2.8 | 2 | 7.3 | w. | 25 | sw. | 27 | 17 | 7 | 7 | 3.6 | 0.0 | 0.0 |
| Knoxville [2] | 995 | 66 | 84 | 29.06 | 30.10 | +.01 | 63.6 | +3.7 | 90 | 8 | 76 | 36 | 29 | 51 | 38 | 52 | 47 | 69 | .38 | −2.2 | 4 | 5.2 | sw. | 20 | nw. | 22 | 17 | 9 | 5 | 3.5 | .0 | .0 |
| Memphis [2] | 399 | 78 | 86 | 29.77 | 30.07 | .00 | 66.6 | +3.3 | 89 | 23 | 76 | 35 | 31 | 57 | 27 | 56 | 53 | 77 | .94 | −1.7 | 4 | 8.2 | sw. | 25 | nw. | 27 | 20 | 6 | 5 | 3.1 | .0 | .0 |
| Nashville [2] | 546 | 168 | 188 | 29.44 | 30.08 | .00 | 64.6 | +3.6 | 91 | 8 | 76 | 33 | 29 | 54 | 38 | 54 | 48 | 66 | 1.13 | −1.4 | 6 | 8.5 | sw. | 28 | nw. | 27 | 19 | 6 | 6 | 3.7 | .0 | .0 |
| Lexington | 989 | 6 | .... | .... | .... | .... | 59.9 | +2.5 | 91 | 9 | 74 | 29 | 29 | 46 | 40 | .... | .... | .... | 2.58 | .0 | 5 | .... | s. | .... | .... | .... | 18 | 8 | 5 | .... | .0 | .0 |
| Louisville [2] | 525 | 106 | 120 | 29.48 | 30.07 | −.01 | 61.6 | +2.2 | 89 | 8 | 72 | 35 | 29 | 51 | 34 | 50 | 45 | 67 | 1.38 | −1.3 | 4 | 9.1 | sw. | 31 | sw. | 25 | 20 | 5 | 6 | 4.1 | .0 | .0 |
| Evansville | 431 | 76 | 116 | 29.60 | 30.07 | −.01 | 62.6 | +3.2 | 91 | 7 | 74 | 35 | 31 | 52 | 36 | 52 | 45 | 60 | 1.91 | −.9 | 6 | 9.2 | sw. | 28 | n. | 27 | 18 | 5 | 8 | 3.6 | T | .0 |
| Indianapolis [2] | 823 | 98 | 129 | 29.18 | 30.05 | −.02 | 58.7 | +3.0 | 89 | 8 | 69 | 32 | 29 | 48 | 34 | 47 | 42 | 70 | 2.90 | +.2 | 7 | 8.3 | sw. | 25 | nw. | 22 | 15 | 7 | 9 | 4.1 | .0 | .0 |
| Terre Haute | 575 | 65 | 149 | 29.42 | 30.04 | .... | 60.2 | .... | 93 | 8 | 72 | 32 | 15 | 48 | 36 | 50 | 43 | 62 | 1.89 | −.8 | 10 | 10.0 | s. | 29 | sw. | 27 | 15 | 8 | 8 | 4.3 | .0 | .0 |
| Cincinnati [2] | 627 | 11 | 51 | 29.53 | 30.07 | −.01 | 59.0 | +3.3 | 90 | 8 | 70 | 30 | 29 | 48 | 39 | 49 | 44 | 72 | 2.18 | −.3 | 6 | 7.3 | sw. | 22 | sw. | 27 | 19 | 6 | 6 | 3.6 | .0 | .0 |
| Columbus | 822 | 90 | 110 | 29.17 | 30.06 | −.02 | 57.2 | +2.0 | 89 | 8 | 68 | 31 | 15 | 47 | 35 | 47 | 41 | 69 | 3.17 | +.7 | 4 | 9.7 | s. | 31 | w. | 22 | 16 | 5 | 10 | 4.6 | T | .0 |
| Dayton | 900 | 186 | 213 | 29.10 | 30.06 | .... | 57.3 | +2.3 | 87 | 8 | 68 | 28 | 15 | 47 | 36 | 49 | 43 | 64 | 2.25 | −.3 | 6 | 10.8 | sw. | 36 | nw. | 22 | 16 | 8 | 7 | 4.0 | .0 | .0 |
| Elkins [2] | 1,947 | 65 | 83 | 27.98 | 30.11 | +.01 | 53.4 | +1.1 | 84 | 8 | 67 | 21 | 15 | 40 | 44 | 45 | 41 | 80 | 4.32 | +1.4 | 9 | 5.5 | w. | 27 | w. | 28 | 8 | 8 | 15 | 6.2 | T | T |
| Parkersburg | 637 | 77 | 84 | 29.39 | 30.07 | −.01 | 58.2 | +2.1 | 89 | 9 | 70 | 28 | 15 | 46 | 40 | 49 | 44 | 68 | 3.13 | +.6 | 8 | 6.3 | se. | 24 | w. | 28 | 16 | 8 | 7 | 3.8 | .0 | .0 |
| Pittsburgh [1] | 1,273 | 39 | 54 | 28.71 | 30.06 | −.02 | 55.5 | −.2 | 87 | 9 | 66 | 27 | 29 | 45 | 33 | 47 | 41 | 67 | 3.14 | +.6 | 12 | 11.0 | s. | 34 | w. | 28 | 11 | 8 | 12 | 5.4 | T | .0 |
| *Lower Lake Region* | | | | | | | 52.9 | +0.8 | | | | | | | | | | 75 | 2.51 | −0.4 | | | | | | | | | | 5.9 | | |
| Buffalo [2] | 768 | 243 | 280 | 29.24 | 30.01 | −.04 | 52.0 | +.1 | 74 | 9 | 59 | 31 | 28 | 45 | 27 | 45 | 42 | 77 | 1.83 | −1.5 | 12 | 16.0 | sw. | 49 | nw. | 28 | 10 | 8 | 13 | 5.9 | T | .0 |
| Canton | 448 | 10 | 61 | 29.50 | 29.99 | .... | 47.0 | −.2 | 77 | 10 | 58 | 20 | 18 | 36 | 37 | 42 | 38 | 77 | 2.42 | −.6 | 13 | 8.6 | w. | 30 | w. | 14 | 6 | 7 | 18 | 6.9 | T | .0 |
| Ithaca | 836 | 77 | 100 | 29.12 | 30.04 | .... | 51.2 | +.1 | 87 | 10 | 61 | 27 | 23 | 42 | 34 | 45 | 42 | 77 | 2.49 | −.5 | 16 | 9.3 | nw. | 29 | nw. | 28 | 5 | 14 | 12 | 6.5 | T | .0 |
| Oswego | 335 | 71 | 83 | 29.63 | 30.00 | −.05 | 51.4 | +.2 | 82 | 10 | 60 | 27 | 25 | 43 | 34 | 46 | 41 | 71 | 2.54 | −.7 | 14 | 10.2 | se. | 30 | nw. | 28 | 6 | 6 | 19 | 7.3 | T | .0 |
| Rochester [2] | 523 | 86 | 102 | 29.41 | 30.02 | −.03 | 52.0 | +.5 | 81 | 5 | 60 | 30 | 24 | 44 | 33 | 45 | 42 | 82 | 1.53 | −1.1 | 14 | 8.6 | sw. | 30 | sw. | 19 | 6 | 8 | 17 | 6.6 | T | .0 |
| Syracuse [2] | 596 | 65 | 79 | 29.57 | 30.01 | −.05 | 52.0 | +.4 | 86 | 10 | 62 | 28 | 24 | 42 | 36 | 45 | 41 | 78 | 2.79 | .0 | 15 | 7.2 | s. | 23 | nw. | 28 | 7 | 9 | 15 | 6.5 | T | .0 |
| Erie | 714 | 57 | 81 | 29.25 | 30.02 | −.03 | 54.6 | +1.2 | 82 | 8 | 62 | 34 | 18 | 47 | 26 | 49 | 45 | 74 | 4.56 | +.9 | 15 | 8.8 | s. | 26 | w. | 28 | 9 | 7 | 15 | 6.0 | .1 | T |
| Cleveland [2] | 762 | 267 | 318 | 29.16 | 30.04 | −.02 | 56.2 | +2.6 | 88 | 8 | 64 | 33 | 29 | 49 | 27 | 48 | 43 | 72 | 1.84 | −.9 | 13 | 16.8 | s. | 43 | nw. | 28 | 11 | 8 | 12 | 5.2 | T | .0 |
| Sandusky | 629 | 5 | 67 | 29.36 | 30.05 | −.01 | 55.8 | +1.5 | 92 | 8 | 66 | 29 | 29 | 45 | 33 | .... | .... | .... | 2.21 | −.2 | 10 | 9.5 | sw. | 27 | w. | 28 | 13 | 5 | 13 | 5.2 | .1 | .0 |
| Toledo [2] | 628 | 79 | 87 | 29.35 | 30.04 | −.01 | 54.8 | +1.4 | 91 | 8 | 64 | 31 | 15 | 46 | 30 | 46 | 42 | 73 | 2.54 | +.2 | 9 | 9.6 | w. | 31 | nw. | 21 | 16 | 5 | 10 | 4.5 | T | .0 |
| Fort Wayne | 857 | 69 | 84 | 29.14 | 30.03 | .... | 54.5 | +1.0 | 89 | 8 | 65 | 30 | 29 | 44 | 33 | 46 | 42 | 73 | 3.71 | +1.1 | 11 | 9.4 | sw. | 29 | w. | 19 | 12 | 9 | 10 | 4.9 | T | .0 |
| Detroit [1] | 626 | 5 | 78 | 29.34 | 30.02 | −.03 | 52.9 | +.4 | 89 | 8 | 63 | 29 | 15 | 43 | 29 | 46 | 42 | 73 | 1.66 | −1.0 | 14 | 10.5 | nw. | 34 | w. | 19 | 10 | 10 | 11 | 5.5 | T | .0 |
| *Upper Lake Region* | | | | | | | 48.4 | 0.0 | | | | | | | | | | 76 | 2.51 | −0.2 | | | | | | | | | | 6.3 | | |
| Alpena | 609 | 13 | 89 | 29.30 | 29.96 | −.07 | 47.2 | +.1 | 80 | 4 | 56 | 25 | 24 | 39 | 30 | 42 | 39 | 79 | 1.10 | −1.6 | 12 | 11.3 | nw. | 32 | nw. | 21 | 7 | 10 | 14 | 6.4 | T | .0 |
| Escanaba | 612 | 51 | 72 | 29.29 | 29.96 | −.05 | 45.4 | −.6 | 70 | 5 | 52 | 27 | 28 | 39 | 25 | 42 | 38 | 78 | 2.16 | −.5 | 14 | 11.4 | nw. | 31 | s. | 15 | 6 | 12 | 13 | 6.6 | .5 | .0 |
| Grand Rapids [2] | 707 | 70 | 244 | 29.24 | 29.99 | −.05 | 52.8 | +1.6 | 84 | 9 | 62 | 32 | 17 | 43 | 32 | 45 | 42 | 80 | 2.64 | −.2 | 17 | 11.9 | sw. | 42 | sw. | 21 | 7 | 9 | 15 | 6.2 | T | T |
| Lansing | 878 | 5 | 90 | 29.06 | 30.01 | .... | 50.9 | +.6 | 84 | 8 | 61 | 26 | 15 | 41 | 35 | 45 | 42 | 80 | 3.60 | +1.1 | 14 | 9.0 | s. | 22 | w. | 12 | 10 | 11 | 10 | 5.5 | T | T |
| Ludington | 637 | 60 | 66 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Marquette | 734 | 44 | 69 | 29.12 | 29.93 | −.08 | 44.4 | −2.3 | 77 | 7 | 51 | 25 | 28 | 38 | 31 | 40 | 36 | 78 | 2.55 | −.2 | 16 | 8.6 | nw. | 36 | sw. | 15 | 2 | 12 | 17 | 7.2 | 9.1 | .5 |
| Sault Ste. Marie [1] | 724 | 5 | 33 | 29.14 | 29.94 | −.07 | 42.0 | −2.6 | 68 | 5 | 50 | 21 | 24 | 34 | 33 | 39 | 36 | 84 | 3.90 | +.2 | 16 | 9.2 | se. | 30 | nw. | 16 | 2 | 6 | 23 | 7.9 | 4.0 | .1 |
| Chicago | 673 | 7 | 131 | 29.28 | 30.01 | −.02 | 56.0 | +2.0 | 84 | 7 | 65 | 32 | 31 | 47 | 32 | 48 | 42 | 66 | 1.79 | −.7 | 10 | 11.3 | sw. | 31 | sw. | 21 | 13 | 8 | 10 | 4.8 | .0 | .0 |
| Green Bay | 617 | 109 | 141 | 29.28 | 29.95 | −.07 | 49.0 | +.5 | 77 | 7 | 57 | 27 | 17 | 41 | 29 | 42 | 38 | 71 | 2.83 | +.3 | 8 | 10.8 | s. | 31 | sw. | 5 | 6 | 11 | 14 | 6.5 | T | .0 |
| Milwaukee [2] | 681 | 97 | 221 | 29.23 | 29.99 | −.04 | 53.2 | +2.1 | 83 | 7 | 62 | 31 | 28 | 44 | 29 | 45 | 40 | 73 | 2.43 | +.1 | 13 | 13.3 | w. | 34 | sw. | 5 | 10 | 8 | 13 | 5.7 | T | .0 |
| Duluth [1] | 1,133 | 5 | 47 | 28.68 | 29.91 | −.09 | 43.0 | −1.1 | 71 | 2 | 51 | 20 | 17 | 35 | 28 | 37 | 33 | 76 | 2.09 | −.2 | 11 | 13.0 | nw. | 40 | nw. | 12 | 7 | 13 | 11 | 6.2 | 1.2 | T |
| *North Dakota* | | | | | | | 41.4 | −2.3 | | | | | | | | | | 70 | 0.99 | −0.3 | | | | | | | | | | 6.8 | | |
| Moorhead, Minn. | 940 | 50 | 58 | 28.96 | 29.94 | −.06 | 42.6 | −1.9 | 79 | 1 | 52 | 13 | 28 | 34 | 40 | 37 | 31 | 71 | 1.43 | −.3 | 8 | 9.3 | nw. | 26 | nw. | 11 | 4 | 7 | 20 | 7.4 | 1.4 | .0 |
| Bismarck [1] | 1,677 | 8 | 57 | 28.19 | 29.98 | −.01 | 43.0 | −1.9 | 76 | 1 | 54 | 8 | 28 | 32 | 46 | 36 | 29 | 66 | .81 | −.1 | 6 | 8.8 | nw. | 32 | nw. | 11 | 2 | 19 | 10 | 6.8 | .7 | .0 |
| Devils Lake | 1,478 | 11 | 44 | 28.35 | 29.95 | −.04 | 39.2 | −3.2 | 71 | 19 | 48 | 11 | 28 | 30 | 43 | 35 | 30 | 75 | .68 | −.6 | 8 | 10.0 | nw. | 33 | nw. | 15 | 4 | 7 | 20 | 7.6 | 1.3 | T |
| Lemmon, S. Dak. | 2,602 | 4 | 38 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Grand Forks | 832 | 11 | 71 | .... | .... | .... | 40.3 | −3.3 | 70 | 19 | 49 | 19 | 28 | 32 | 44 | 37 | 32 | .... | 1.74 | +.3 | 9 | 10.0 | nw. | .... | .... | .... | .... | .... | .... | .... | 2.5 | T |
| Williston | 1,878 | 42 | 50 | 27.97 | 29.98 | .00 | 42.0 | −1.4 | 73 | 1 | 53 | 10 | 16 | 31 | 41 | 36 | 30 | 66 | .31 | −.6 | 5 | 8.9 | nw. | 32 | nw. | 10 | 9 | 14 | 8 | 5.3 | .1 | .0 |
| *Upper Mississippi Valley* | | | | | | | 55.5 | +2.2 | | | | | | | | | | 66 | 2.03 | −0.4 | | | | | | | | | | 4.5 | | |
| Minneapolis, St. Paul, Minn. [1] | 838 | 32 | 61 | 29.03 | 29.94 | −.07 | 47.5 | −1.4 | 77 | 1 | 57 | 23 | 28 | 38 | 36 | 41 | 35 | 67 | 1.56 | −.5 | 13 | 12.3 | nw. | 34 | se. | 4 | 8 | 9 | 14 | 6.4 | .6 | .0 |
| Springfield, Minn. | 1,025 | 4 | 42 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| La Crosse [2] | 714 | 11 | 48 | 29.23 | 29.96 | −.06 | 50.7 | +.4 | 79 | 7 | 60 | 25 | 17 | 41 | 32 | 43 | 38 | 71 | 1.71 | −1.2 | 10 | 6.0 | s. | 19 | s. | 15 | 10 | 10 | 11 | 5.5 | .5 | .0 |
| Madison | 974 | 70 | 78 | 29.04 | 29.98 | −.05 | 52.0 | +1.7 | 84 | 7 | 62 | 29 | 28 | 42 | 34 | 44 | 39 | 71 | 1.93 | −.5 | 11 | 9.1 | s. | 24 | se. | 15 | 11 | 6 | 14 | 5.9 | T | .0 |
| Charles City | 1,015 | 10 | 81 | 28.88 | 29.98 | −.04 | 49.9 | +1.3 | 80 | 7 | 61 | 24 | 28 | 38 | 42 | 42 | 38 | 67 | 1.55 | −.8 | 10 | 7.3 | se. | 23 | sw. | 18 | 14 | 8 | 9 | 4.6 | T | .0 |
| Davenport | 606 | 66 | 161 | 29.34 | 30.00 | −.04 | 56.0 | +2.3 | 89 | 7 | 67 | 28 | 14 | 45 | 38 | 47 | 40 | 62 | 1.91 | −.5 | 8 | 10.7 | sw. | 27 | s. | 15 | 13 | 8 | 10 | 4.7 | T | .0 |
| Des Moines [2] | 860 | 5 | 99 | 28.93 | 29.96 | −.07 | 54.8 | +1.4 | 92 | 7 | 68 | 26 | 14 | 42 | 44 | 46 | 38 | 60 | 1.16 | −1.3 | 7 | 10.6 | nw. | 30 | sw. | 18 | 17 | 8 | 6 | 3.5 | .0 | .0 |
| Dubuque | 699 | 60 | 79 | 29.23 | 29.98 | −.06 | 53.4 | +1.5 | 87 | 7 | 64 | 28 | 28 | 42 | 38 | 45 | 39 | 65 | 4.19 | +1.7 | 11 | 6.6 | s. | 22 | nw. | 13 | 13 | 7 | 11 | 5.1 | T | .0 |
| Keokuk | 614 | 64 | 78 | 29.35 | 30.00 | −.05 | 58.6 | +3.2 | 94 | 7 | 70 | 27 | 14 | 47 | 38 | 48 | 40 | 58 | 2.35 | +.1 | 8 | 8.2 | sw. | 25 | w. | 27 | 15 | 8 | 8 | 4.4 | T | .0 |
| Cairo | 358 | 87 | 93 | 29.69 | 30.07 | .00 | 63.3 | +2.9 | 87 | 7 | 74 | 34 | 31 | 53 | 34 | 54 | 49 | 67 | 1.47 | −1.3 | 7 | 8.4 | s. | 24 | nw. | 27 | 18 | 10 | 3 | 3.3 | T | .0 |
| Peoria [2] | 609 | 11 | 45 | 29.30 | 30.02 | −.03 | 57.1 | +5.1 | 89 | 6 | 70 | 29 | 14 | 44 | 40 | 47 | 42 | 70 | 3.80 | +1.5 | 11 | 6.0 | s. | 16 | w. | 23 | 16 | 11 | 4 | 3.5 | .0 | .0 |
| Springfield, Ill. [2] | 636 | 5 | 191 | 29.37 | 30.03 | −.02 | 59.6 | +3.8 | 90 | 8 | 72 | 30 | 31 | 47 | 37 | 47 | 43 | 72 | 1.99 | −.5 | 7 | 12.3 | s. | 31 | w. | 9 | 14 | 7 | 10 | 4.3 | .0 | .0 |
| St. Louis [2] | 568 | 179 | 303 | 29.43 | 30.04 | −.02 | 62.6 | +3.8 | 93 | 7 | 73 | 33 | 31 | 52 | 36 | 52 | 44 | 58 | .77 | −2.0 | 9 | 12.7 | sw. | 32 | sw. | 25 | 19 | 9 | 3 | 2.9 | T | .0 |
| *Missouri Valley* | | | | | | | 56.9 | +2.7 | | | | | | | | | | 60 | 1.13 | −1.1 | | | | | | | | | | 3.8 | | |
| Columbia, Mo. [2] | 784 | 6 | 66 | 29.18 | 30.02 | −.03 | 61.1 | +4.5 | 96 | 7 | 74 | 25 | 31 | 48 | 40 | 50 | 43 | 62 | 1.33 | −1.3 | 5 | 8.1 | s. | 29 | sw. | 8 | 17 | 7 | 7 | 4.1 | .0 | .0 |
| Kansas City [1] | 750 | 32 | 45 | 29.18 | 29.99 | −.05 | 62.1 | +4.4 | 98 | 7 | 75 | 28 | 31 | 49 | 43 | 51 | 42 | 53 | .95 | −2.0 | 3 | 10.0 | sw. | 34 | n. | 29 | 20 | 5 | 6 | 3.2 | .0 | .0 |
| St. Joseph [2] | 967 | 11 | 49 | 29.11 | 29.99 | .... | 60.0 | +4.0 | 96 | 7 | 72 | 29 | 31 | 48 | 38 | 48 | 42 | 64 | .95 | −1.9 | 4 | 9.1 | s. | 26 | s. | 4 | 23 | 4 | 4 | 2.5 | .0 | .0 |
| Springfield, Mo. [2] | 1,324 | 5 | 78 | 28.62 | 30.06 | +.01 | 62.2 | +4.0 | 92 | 7 | 75 | 27 | 31 | 50 | 36 | 50 | 45 | 70 | 2.26 | −.8 | 6 | 8.5 | s. | 25 | sw. | 9 | 19 | 7 | 5 | 3.3 | T | .0 |
| Topeka | 987 | 65 | 87 | 28.93 | 29.98 | .... | 62.2 | +5.2 | 97 | 7 | 76 | 31 | 31 | 49 | 43 | 50 | 40 | 51 | .83 | −1.6 | 4 | 10.3 | s. | 28 | s. | 4 | 19 | 9 | 3 | 3.0 | .0 | .0 |
| Lincoln [1] | 1,189 | 11 | 81 | 28.70 | 29.97 | −.06 | 56.4 | +2.2 | 87 | 6 | 70 | 27 | 30 | 43 | 39 | 44 | 36 | 57 | .93 | −1.0 | 4 | 9.9 | s. | 33 | sw. | 4 | 16 | 9 | 6 | 3.7 | T | .0 |
| Omaha [1] | 982 | 31 | 44 | 28.92 | 29.97 | −.06 | 55.4 | +1.1 | 87 | 6 | 68 | 27 | 28 | 42 | 39 | 45 | 37 | 58 | 1.09 | −1.1 | 4 | 11.1 | nw. | 45 | sw. | 4 | 15 | 10 | 6 | 3.9 | T | .0 |
| Valentine | 2,598 | 47 | 54 | 27.26 | 29.98 | −.03 | 49.6 | +.3 | 83 | 6 | 62 | 24 | 30 | 37 | 47 | 41 | 34 | 61 | 1.88 | +.8 | 5 | 9.7 | w. | 25 | nw. | 29 | 14 | 9 | 8 | 4.5 | T | .0 |
| Sioux City | 1,138 | 64 | 106 | 28.74 | 29.97 | −.05 | 52.5 | +1.6 | 84 | 6 | 65 | 22 | 28 | 40 | 41 | 44 | 36 | 60 | .26 | −1.5 | 4 | 10.6 | nw. | 37 | nw. | 29 | 15 | 6 | 10 | 4.6 | .0 | .0 |
| Huron [1] | 1,289 | 27 | 41 | 28.58 | 29.97 | −.04 | 47.6 | −.1 | 87 | 6 | 61 | 13 | 28 | 34 | 46 | 40 | 32 | 62 | .81 | −.5 | 8 | 14.5 | nw. | 40 | w. | 11 | 15 | 7 | 9 | 5.0 | T | .0 |
| *Northern Slope* | | | | | | | 47.4 | +2.4 | | | | | | | | | | 59 | 0.62 | −0.4 | | | | | | | | | | 5.5 | | |
| Billings | 3,570 | 17 | 31 | 26.32 | 30.02 | .... | 49.2 | .... | 78 | 22 | 61 | 24 | 24 | 37 | 40 | 40 | 32 | 60 | .92 | .... | 6 | 11.9 | sw. | 40 | nw. | 19 | 5 | 11 | 15 | 6.3 | 1.4 | .0 |
| Havre | 2,507 | 11 | 67 | 27.34 | 30.00 | +.02 | 43.6 | −.9 | 77 | 14 | 56 | 4 | 26 | 31 | 49 | 37 | 30 | 62 | .37 | −.3 | 4 | 10.0 | sw. | 43 | sw. | 20 | 13 | 9 | 9 | 5.2 | 2.3 | .0 |
| Helena | 4,124 | 85 | 111 | 25.83 | 30.04 | +.01 | 46.7 | +1.8 | 72 | 23 | 56 | 12 | 25 | 37 | 35 | 39 | 30 | 57 | 1.24 | +.4 | 8 | 7.9 | sw. | 27 | sw. | 28 | 3 | 11 | 17 | 7.3 | 4.5 | .0 |
| Missoula | 3,263 | 80 | 91 | .... | .... | .... | 48.2 | +3.4 | 73 | 23 | 59 | 23 | 25 | 38 | 35 | 41 | 35 | 69 | .86 | −.3 | 9 | 5.6 | se. | 30 | ne. | 24 | 7 | 8 | 16 | 6.3 | 3.0 | .0 |
| Kalispell | 2,973 | 48 | 56 | 26.97 | 30.04 | +.03 | 46.4 | +2.9 | 72 | 14 | 57 | 14 | 25 | 36 | 40 | 40 | 32 | 61 | .22 | −.8 | 4 | 6.2 | nw. | 24 | n. | 24 | 2 | 7 | 22 | 7.6 | 2.9 | .0 |
| Miles City [1] | 2,371 | 48 | 55 | 27.23 | 30.00 | .00 | 48.2 | +1.7 | 78 | 1 | 61 | 26 | 27 | 36 | 43 | 38 | 31 | 60 | .06 | −.8 | 4 | 6.8 | s. | 31 | nw. | 28 | 4 | 14 | 13 | 6.7 | T | .0 |

**See footnotes at end of table.**

TABLE 2.—*Climatological data for Weather Bureau Stations, October 1939*—Continued

| | Elevation of instruments | | | Pressure | | | Temperature of the air | | | | | | | | | Mean wet thermometer | Mean temperature of the dew-point | Mean relative humidity | Precipitation | | | Wind | | | | Clear days | Partly cloudy days | Cloudy days | Average cloudiness, tenths | Total snowfall | Snow, sleet, and ice on ground at end of month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Barometer above sea level | Thermometer above ground | Anemometer above ground | Station, reduced to mean of 24 hours | Sea level, reduced to mean of 24 hours | Departure from normal | Mean max. + mean min. ÷2 | Departure from normal | Maximum | Date | Mean maximum | Minimum | Date | Mean minimum | Greatest daily range | | | | Total | Departure from normal | Days with 0.01 inch or more | Average hourly velocity | Prevailing direction | Maximum velocity: Miles per hour | Maximum velocity: Direction | Maximum velocity: Date | | | | | |
| *Northern Slope*—Con. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | *Ft.* | *Ft.* | *Ft.* | *In.* | *In.* | *In.* | °*F.* | °*F.* | °*F.* | | °*F.* | °*F.* | | °*F.* | °*F.* | °*F.* | °*F.* | % | *In.* | *In.* | | *Miles* | | | | | | | *0–10* | *In.* | *In.* |
| Rapid City [2] | 3,259 | 50 | 58 | 26.66 | 30.00 | −0.01 | 49.2 | +0.7 | 76 | 1 | 61 | 28 | 30 | 38 | 43 | 40 | 32 | 62 | 1.34 | +0.4 | 9 | 7.8 | n. | 29 | ne. | 15 | 10 | 14 | 7 | 5.0 | 1.2 | 0.0 |
| Cheyenne [1] | 6,144 | 5 | 39 | 23.98 | 29.97 | −.04 | 48.8 | +4.0 | 74 | 23 | 63 | 24 | 29 | 35 | 42 | 37 | 26 | 48 | .37 | −.6 | 5 | 12.2 | nw. | 40 | w. | 28 | 14 | 11 | 6 | 4.1 | 2.9 | .0 |
| Lander | 5,352 | 60 | 68 | 24.66 | 29.98 | −.06 | 47.6 | +4.1 | 73 | 33 | 63 | 22 | 30 | 33 | 43 | 38 | 28 | 52 | .31 | −1.0 | 5 | 5.0 | sw. | 32 | w. | 1 | 11 | 14 | 6 | 4.4 | .9 | .0 |
| Sheridan | 3,790 | 10 | 47 | 26.11 | 30.02 | ..... | 47.4 | ..... | 77 | 17 | 63 | 24 | 28 | 32 | 49 | 39 | 30 | 60 | .47 | −.6 | 5 | 5.2 | nw. | 21 | nw. | 12 | 11 | 15 | 5 | 4.8 | .8 | .0 |
| Yellowstone Park | 6,235 | 12 | 46 | 23.93 | 30.12 | +.10 | 42.7 | +3.0 | 64 | 22 | 53 | 21 | 25 | 32 | 36 | 35 | 28 | 62 | 1.05 | −.2 | 8 | 8.2 | sw. | 28 | sw. | 23 | 10 | 11 | 10 | 5.7 | 3.4 | .0 |
| North Platte [2] | 2,821 | 11 | 51 | 27.08 | 29.98 | −.04 | 53.0 | +3.3 | 86 | 2 | 68 | 25 | 28 | 38 | 46 | 41 | 33 | 60 | .56 | −.5 | 2 | 7.6 | w. | 23 | n. | 29 | 22 | 5 | 4 | 2.7 | T | .0 |
| *Middle Slope* | | | | | | | 59.9 | +4.1 | | | | | | | | | | 46 | 0.89 | −0.8 | | | | | | | | | 2.5 | | |
| Denver [2] | 5,292 | 106 | 113 | 24.71 | 29.97 | −.04 | 54.7 | +3.5 | 79 | 1 | 68 | 23 | 30 | 42 | 37 | 40 | 26 | 43 | .89 | −.2 | 3 | 8.1 | s. | 28 | ne. | 29 | 19 | 10 | 2 | 3.0 | 5.6 | .0 |
| Pueblo [2] | 4,690 | 79 | 86 | 25.19 | 29.96 | −.03 | 54.9 | +2.9 | 85 | 6 | 71 | 16 | 30 | 38 | 51 | 40 | 24 | 38 | .02 | −.6 | 1 | 7.2 | e. | 34 | w. | 4 | 24 | 4 | 3 | 2.3 | T | .0 |
| Chadron, Nebr. | 3,439 | 4 | 58 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Concordia | 1,392 | 50 | 58 | 28.50 | 29.98 | −.05 | 59.3 | +3.4 | 90 | 6 | 73 | 29 | 28 | 46 | 43 | 47 | 36 | 49 | .60 | −1.4 | 1 | 8.5 | sw. | 24 | s. | 2 | 20 | 7 | 4 | 2.9 | .0 | .0 |
| Dodge City | 2,509 | 10 | 86 | 27.38 | 29.96 | −.06 | 59.6 | +3.5 | 90 | 6 | 75 | 28 | 30 | 44 | 40 | 46 | 33 | 43 | .28 | −1.0 | 2 | 12.5 | sw. | 36 | sw. | 7 | 26 | 3 | 2 | 1.9 | .0 | .0 |
| Wichita [2] | 1,358 | 85 | 93 | 28.52 | 29.98 | −.05 | 64.0 | +5.4 | 95 | 6 | 76 | 35 | 31 | 52 | 36 | 50 | 40 | 51 | 1.14 | −1.4 | 4 | 11.3 | s. | 28 | sw. | 18 | 24 | 4 | 3 | 2.1 | .0 | .0 |
| Oklahoma City [2] | 1,214 | 10 | 47 | 28.65 | 30.02 | −.01 | 67.2 | +5.7 | 94 | 6 | 80 | 37 | 31 | 55 | 40 | 54 | 45 | 53 | 2.39 | −.5 | 4 | 9.6 | s. | 26 | n. | 29 | 21 | 6 | 4 | 2.6 | .0 | .0 |
| *Southern Slope* | | | | | | | 66.4 | +3.2 | | | | | | | | | | 55 | 1.10 | −0.8 | | | | | | | | | 3.3 | | |
| Abilene [2] | 1,738 | 10 | 56 | 28.21 | 30.01 | .00 | 69.6 | +4.2 | 96 | 6 | 82 | 38 | 31 | 57 | 38 | 56 | 48 | 58 | 1.92 | −.6 | 5 | 9.7 | s. | 28 | s. | 4 | 17 | 6 | 8 | 3.4 | .0 | .0 |
| Amarillo [2] | 3,676 | 10 | 49 | 26.37 | 30.00 | .00 | 63.0 | +5.3 | 90 | 6 | 77 | 32 | 30 | 49 | 36 | 47 | 37 | 52 | 1.10 | −.6 | 2 | 9.5 | sw. | 22 | se. | 1 | 25 | 4 | 2 | 1.9 | .0 | .0 |
| Del Rio | 960 | 63 | 71 | 29.01 | 29.99 | +.01 | 72.6 | +2.6 | 92 | 6 | 82 | 45 | 31 | 64 | 32 | 62 | 56 | 63 | 1.12 | −.7 | 6 | 8.4 | se. | 21 | se. | 8 | 10 | 8 | 13 | 5.8 | .0 | .0 |
| Roswell | 3,566 | 75 | 85 | 26.42 | 30.01 | +.05 | 60.4 | +.9 | 91 | 6 | 77 | 31 | 30 | 44 | 51 | 47 | 36 | 48 | .25 | −1.2 | 2 | 7.1 | s. | 26 | nw. | 24 | 23 | 6 | 2 | 2.0 | .0 | .0 |
| *Southern Plateau* | | | | | | | 62.7 | +0.7 | | | | | | | | | | 42 | 0.60 | −0.1 | | | | | | | | | 1.4 | | |
| El Paso [2] | 3,778 | 82 | 101 | 26.09 | 29.97 | +.05 | 64.4 | +.9 | 90 | 6 | 77 | 41 | 31 | 51 | 39 | 49 | 36 | 45 | .93 | +.1 | 5 | 6.7 | e. | 20 | ne. | 30 | 21 | 8 | 2 | 2.3 | .0 | .0 |
| Albuquerque [1] | 5,314 | 5 | 34 | 24.80 | 29.98 | ..... | 56.0 | −.6 | 80 | 6 | 70 | 28 | 30 | 42 | 38 | 43 | 31 | 45 | .83 | .0 | 3 | 8.1 | se. | 30 | s. | 3 | 27 | 2 | 2 | 1.3 | .0 | .0 |
| Santa Fe | 7,013 | 38 | 53 | 23.32 | 30.03 | +.07 | 50.2 | −.2 | 71 | 6 | 63 | 24 | 30 | 38 | 34 | 38 | 26 | 45 | 1.20 | .0 | 3 | 5.9 | e. | 27 | sw. | 26 | 25 | 4 | 2 | 1.8 | .0 | .0 |
| Flagstaff | 6,907 | 10 | 59 | 23.41 | 29.97 | − | 46.4 | − | 70 | 31 | 62 | 21 | 27 | 30 | 44 | 36 | 26 | 51 | .34 | − | 4 | 8.7 | nw. | 26 | s. | 25 | 23 | 7 | 1 | — | 1.0 | .0 |
| Phoenix [2] | 1,107 | 39 | 51 | 28.76 | 29.91 | −.07 | 70.8 | +.2 | 95 | 22 | 87 | 42 | 27 | 55 | 42 | 53 | 39 | 40 | .02 | −.4 | 1 | 5.2 | e. | 18 | sw. | 7 | 28 | 3 | 0 | 1.1 | .0 | .0 |
| Yuma | 141 | 9 | 54 | 29.77 | 29.91 | +.04 | 74.2 | +.9 | 96 | 17 | 88 | 51 | 27 | 60 | 36 | 57 | 42 | 37 | T | −.3 | 0 | 6.6 | n. | 21 | w. | 7 | 31 | 0 | 0 | .4 | .0 | .0 |
| Independence | 3,957 | 5 | 26 | 26.01 | 30.03 | +.08 | 60.7 | +3.2 | 83 | 11 | 76 | 28 | 26 | 45 | 38 | ..... | ..... | ..... | .21 | ..... | 2 | ..... | ..... | 23 | n. | 3 | ..... | ..... | ..... | ..... | ..... | ..... |
| *Middle Plateau* | | | | | | | 51.6 | +1.2 | | | | | | | | | | 54 | 1.14 | +0.3 | | | | | | | | | 3.2 | | |
| Reno [2] | 4,527 | 61 | 76 | 25.64 | 30.09 | +.10 | 52.2 | +1.4 | 79 | 22 | 67 | 21 | 26 | 37 | 40 | 41 | 33 | 61 | .82 | +.5 | 5 | 5.6 | w. | 33 | nw. | 24 | 20 | 6 | 5 | 2.9 | T | .0 |
| Tonopah | 6,090 | 12 | 20 | ..... | ..... | ..... | 51.4 | ..... | ..... | 72 | 23 | 61 | 23 | 26 | 42 | 29 | 41 | 32 | ..... | .94 | ..... | 4 | ..... | se. | ..... | ..... | ..... | ..... | ..... | ..... | T | .0 |
| Winnemucca | 4,344 | 18 | 56 | 25.70 | 30.10 | +.05 | 49.6 | +1.3 | 77 | 14 | 66 | 13 | 26 | 34 | 46 | 41 | 32 | 59 | 2.40 | +1.8 | 7 | 6.3 | ne. | 28 | w. | 24 | 14 | 7 | 10 | 4.5 | T | .0 |
| Modena | 5,473 | 10 | 46 | 24.68 | 30.01 | +.05 | 48.7 | +.7 | 73 | 14 | 64 | 25 | 28 | 33 | 45 | 39 | 28 | 70 | .61 | −.1 | 4 | 9.6 | w. | 41 | sw. | 24 | 23 | 5 | 3 | 2.2 | 2.4 | .0 |
| Salt Lake City [1] | 4,227 | 32 | 46 | 25.79 | 30.04 | +.03 | 53.8 | +1.3 | 77 | 16 | 65 | 33 | 26 | 42 | 32 | 43 | 35 | 58 | 1.42 | .0 | 8 | 6.8 | se. | 34 | se. | 24 | 16 | 11 | 4 | 3.6 | T | .0 |
| Grand Junction | 4,602 | 60 | 68 | 25.43 | 30.01 | +.02 | 53.9 | +1.1 | 79 | 1 | 68 | 30 | 29 | 40 | 35 | 42 | 29 | 43 | .44 | −.5 | 4 | 5.9 | se. | 30 | s. | 2 | 19 | 8 | 4 | 2.6 | .0 | .0 |
| *Northern Plateau* | | | | | | | 51.3 | +1.6 | | | | | | | | | | 63 | 0.72 | −0.4 | | | | | | | | | 5.8 | | |
| Baker | 3,471 | 36 | 54 | 26.62 | 30.13 | +.05 | 47.3 | +.7 | 75 | 12 | 59 | 25 | 26 | 35 | 40 | 39 | 33 | 68 | .50 | −.4 | 5 | 5.9 | s. | 17 | n. | 2 | 8 | 8 | 15 | 6.1 | 1.8 | SK .0 |
| Boise [2] | 2,739 | 79 | 87 | 27.27 | 30.08 | +.02 | 52.3 | +1.2 | 79 | 23 | 64 | 29 | 26 | 41 | 40 | 44 | 39 | 69 | .70 | −.5 | 8 | 4.4 | se. | 18 | nw. | 8 | 10 | 10 | 11 | 5.4 | T | .0 |
| Pocatello [1] | 4,478 | 5 | 31 | 25.54 | 30.06 | +.02 | 49.2 | +.8 | 73 | 14 | 62 | 25 | 30 | 37 | 43 | 41 | 32 | 58 | .85 | ..... | 7 | 9.6 | sw. | 33 | sw. | 1 | 9 | 8 | 14 | 5.7 | .6 | .0 |
| Spokane [2] | 1,929 | 101 | 110 | 27.98 | 30.07 | +.01 | 49.5 | +1.2 | 73 | 12 | 60 | 29 | 27 | 39 | 35 | 44 | 37 | 66 | .95 | −.2 | 7 | 6.3 | s. | 20 | s. | 4 | 9 | 6 | 16 | 6.3 | 1.0 | .0 |
| Walla Walla | 991 | 57 | 65 | 29.01 | 30.08 | +.01 | 55.4 | +1.9 | 78 | 14 | 65 | 35 | 30 | 46 | 31 | 48 | 41 | 59 | 1.40 | −.1 | 8 | 5.5 | s. | 21 | w. | 19 | 11 | 4 | 16 | 6.1 | .0 | .0 |
| Yakima | 1,076 | 58 | 67 | 28.92 | 30.08 | ..... | 54.3 | +4.1 | 79 | 13 | 67 | 32 | 25 | 41 | 38 | 46 | 37 | 56 | .06 | −.6 | 4 | 4.9 | nw. | 23 | nw. | 23 | 11 | 8 | 12 | 5.5 | .0 | .0 |
| *North Pacific Coast Region* | | | | | | | 54.1 | +1.7 | | | | | | | | | | 81 | 3.47 | −0.3 | | | | | | | | | 6.7 | | |
| North Head | 211 | 8 | 56 | 29.89 | 30.12 | +.07 | 53.6 | +.7 | 74 | 30 | 58 | 41 | 24 | 49 | 26 | 51 | 49 | 89 | 4.21 | −.8 | 21 | 12.7 | s. | 51 | s. | 16 | 9 | 6 | 16 | 6.5 | .0 | .0 |
| Seattle [2] | 125 | 90 | 321 | 30.07 | 30.11 | +.06 | 54.2 | +2.8 | 69 | 13 | 60 | 34 | 25 | 48 | 21 | 50 | 47 | 81 | 2.25 | −.6 | 14 | 8.9 | s. | 33 | s. | 4 | 6 | 6 | 19 | 6.8 | .0 | .0 |
| Tacoma | 263 | 172 | 201 | 29.91 | 30.12 | +.08 | 53.2 | +2.7 | 67 | 22 | 60 | 34 | 25 | 47 | 23 | ..... | ..... | ..... | 2.49 | −.8 | 10 | 7.8 | sw. | 28 | s. | 18 | 3 | 9 | 19 | 7.4 | .0 | .0 |
| Tatoosh Island | 86 | 9 | 55 | 29.99 | 30.09 | +.08 | 50.8 | +.9 | 60 | 13 | 54 | 40 | 25 | 48 | 11 | 49 | 47 | 88 | 8.29 | +.2 | 20 | 14.4 | e. | 51 | s. | 18 | 8 | 2 | 21 | 7.2 | .0 | .0 |
| Medford [1] | 1,329 | 29 | 58 | 28.70 | 30.12 | ..... | 54.2 | +.5 | 82 | 12 | 68 | 32 | 25 | 40 | 42 | 48 | 42 | 70 | 2.15 | +.8 | 9 | ..... | s. | ..... | ..... | ..... | 13 | 6 | 12 | 4.9 | .0 | .0 |
| Portland, Oreg. [2] | 154 | 68 | 106 | 30.07 | 30.11 | +.05 | 56.6 | +2.4 | 80 | 13 | 64 | 38 | 25 | 50 | 28 | 52 | 49 | 79 | 2.14 | −1.0 | 13 | 5.4 | nw. | 22 | s. | 26 | 7 | 6 | 18 | 7.0 | .0 | .0 |
| Roseburg | 510 | 45 | 76 | 29.57 | 30.12 | +.04 | 55.8 | +1.9 | 79 | 14 | 65 | 37 | 25 | 46 | 34 | 52 | 48 | 78 | 2.77 | +.2 | 10 | 3.3 | nw. | 16 | n. | 10 | 3 | 14 | 14 | 6.8 | .0 | .0 |
| *Middle Pacific Coats Region* | | | | | | | 62.3 | +2.0 | | | | | | | | | | 64 | 0.80 | −0.8 | | | | | | | | | 3.3 | | |
| Eureka | 60 | 72 | 88 | 30.04 | 30.11 | +.05 | 54.8 | +1.2 | 79 | 11 | 60 | 43 | 7 | 49 | 27 | 52 | 50 | 85 | 1.82 | −.5 | 7 | 5.6 | n. | 24 | n. | 24 | 7 | 11 | 13 | 6.1 | .0 | .0 |
| Redding [1] | 722 | 20 | 34 | 29.24 | 30.01 | ..... | 67.0 | +2.7 | 92 | 11 | 78 | 37 | 25 | 56 | 31 | 52 | 38 | 40 | .74 | −1.4 | 3 | 7.6 | nw. | 26 | nw. | 6 | 21 | 3 | 7 | 2.8 | .0 | .0 |
| Sacramento [2] | 66 | 92 | 115 | 29.98 | 30.00 | +.01 | 64.5 | +1.6 | 89 | 14 | 78 | 39 | 26 | 51 | 35 | 53 | 45 | 58 | .45 | −.5 | 4 | 5.6 | s. | 24 | nw. | 24 | 24 | 3 | 4 | 1.9 | .0 | .0 |
| San Francisco | 155 | 112 | 132 | 29.85 | 30.02 | +.01 | 63.0 | +2.5 | 90 | 11 | 71 | 50 | 26 | 55 | 31 | 56 | 51 | 73 | ..17 | −1.0 | 3 | 7.5 | w. | 29 | w. | 1 | 24 | 3 | 4 | 2.3 | .0 | .0 |
| *South Pacific Coast Region* | | | | | | | 69.7 | +5.2 | | | | | | | | | | 56 | 0.37 | −0.2 | | | | | | | | | 2.3 | | |
| Fresno [1] | 327 | 97 | 105 | 29.70 | 30.01 | +.05 | 63.3 | ..... | 91 | 13 | 78 | 35 | 26 | 48 | 39 | 54 | 49 | 59 | .99 | ..... | 4 | 4.2 | nw. | 22 | nw. | 24 | 22 | 6 | 3 | 2.1 | .0 | .0 |
| Los Angeles | 338 | 159 | 191 | 29.60 | 29.96 | +.01 | 71.6 | +6.3 | 99 | 22 | 82 | 52 | 26 | 61 | 33 | 56 | 45 | 47 | .13 | −.6 | 1 | 5.9 | ne. | 15 | nw. | 25 | 23 | 5 | 3 | 2.0 | .0 | .0 |
| San Diego [2] | 87 | 62 | 70 | 29.93 | 29.96 | +.01 | 67.8 | +4.1 | 96 | 12 | 77 | 52 | 27 | 59 | 34 | 58 | 51 | 63 | .61 | +.1 | 2 | 6.0 | nw. | 17 | w. | 3 | 22 | 4 | 5 | 2.7 | .0 | .0 |
| *West Indies* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| San Juan, P. R. | 82 | 9 | 54 | 29.80 | 29.88 | ..... | 80.7 | +.9 | 91 | 5 | 86 | 70 | 26 | 76 | 15 | ..... | ..... | ..... | 9.54 | +3.7 | 21 | 10.0 | e. | 31 | e. | 19 | 1 | 20 | 10 | 6.4 | .0 | .0 |
| *Panama Canal* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Balboa Heights | 118 | 6 | 92 | ..... | [3] 29.81 | −.01 | 79.7 | +.5 | 91 | 7 | 86 | 72 | 19 | 74 | 17 | ..... | ..... | [3]86 | 12.93 | +2.7 | 23 | 5.6 | nw. | 25 | s. | 28 | 0 | 8 | 23 | 8.0 | .0 | .0 |
| Cristobal | 36 | 6 | 97 | ..... | [3] 29.82 | .00 | 80.4 | +.6 | 90 | 31 | 85 | 74 | 17 | 76 | 14 | 75 | 74 | [3]85 | 17.52 | +2.0 | 24 | 6.5 | s. | 22 | sw. | 29 | 3 | 3 | 25 | 8.1 | .0 | .0 |
| *Alaska* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fairbanks | 454 | 11 | 87 | [4] 29.28 | [4] 29.82 | ..... | 20.6 | −5.7 | 49 | 1 | 28 | −5 | 18 | 13 | 38 | 20 | 16 | 75 | .79 | +.1 | 16 | 5.8 | e. | 26 | ne. | 6 | 5 | 6 | 20 | 7.6 | 12.8 | 2.5 |
| Juneau | 80 | 96 | 116 | [4] 29.72 | [4] 29.81 | ..... | 41.2 | −2.0 | 53 | 41 | 45 | 29 | 23 | 37 | 16 | 38 | 34 | 75 | 19.11 | +8.2 | 26 | 8.1 | so. | 30 | e. | 17 | 4 | 1 | 26 | 8.4 | 4.0 | .0 |
| Nome | 22 | 5 | 57 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| *Hawaiian Islands* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Honolulu | 38 | 86 | 100 | 29.94 | 29.98 | ..... | 76.6 | −.2 | 84 | 3 | 81 | 69 | 23 | 72 | 11 | 70 | 67 | 74 | 10.31 | +8.8 | 20 | 9.0 | e. | 22 | e. | 5 | 2 | 15 | 14 | 7.0 | .0 | .0 |

[1] Data are airport records.
[2] Barometric and hygrometric data from airport, other data city-office records.
[3] Observations taken bihourly.
[4] Pressure not reduced to a mean of 24 hours.
[5] Barometer data from airport record.

NOTE.—Except as indicated by notes 1 and 2, data in table 2 are city office records.

TABLE 3.—*Data furnished by the Canadian Meteorological Service, October 1939*

| Stations | Altitude above mean sea level, Jan. 1, 1919 | Pressure | | | Temperature of the air | | | | | | Precipitation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Station reduced to mean of 24 hours | Sea level reduced to mean of 24 hours | Departure from normal | Mean max.+ mean min.÷2 | Departure from normal | Mean maximum | Mean minimum | Highest | Lowest | Total | Departure from normal | Total snowfall |
| | *Feet* | *In.* | *In.* | *In.* | *° F.* | *° F.* | *° F.* | *° F.* | *° F.* | *° F.* | *In.* | *In.* | *In.* |
| Cape Race, New Foundland | 99 | | | | | | | | | | | | |
| Sydney, Cape Breton Island | 48 | 29.81 | 29.94 | −0.01 | 49.2 | +1.4 | 55.5 | 42.9 | 72 | 30 | 5.60 | +1.05 | 0.1 |
| Halifax, Nova Scotia | 88 | 29.69 | 29.96 | −.06 | 50.6 | +1.9 | 56.3 | 44.8 | 72 | 26 | 8.36 | +3.14 | .0 |
| Yarmouth, Nova Scotia | 65 | 29.86 | 29.97 | −.06 | 49.6 | +.8 | 56.7 | 42.6 | 66 | 26 | 5.02 | +.89 | T |
| Charlottetown, Prince Edward Island | 38 | 29.86 | 29.95 | −.03 | 48.1 | +.3 | 54.6 | 41.6 | 74 | 26 | 8.85 | +4.55 | .5 |
| Chatham, New Brunswick | 28 | 29.81 | 29.92 | −.07 | 43.6 | −1.7 | 51.8 | 35.4 | 69 | 20 | 5.49 | +1.51 | 1.4 |
| Father Point, Quebec | 20 | 29.89 | 29.91 | −.05 | 41.0 | +.6 | 47.0 | 34.9 | 57 | 24 | 3.69 | +.42 | 2.1 |
| Quebec, Quebec | 296 | | | | | | | | | | | | |
| Doucet, Quebec | 1,236 | 28.55 | 29.93 | −.10 | 35.2 | −2.8 | 43.4 | 27.1 | 66 | 7 | 5.08 | +1.32 | 19.5 |
| Montreal, Quebec | 187 | | | | | | | | | | | | |
| Ottawa, Ontario | 236 | 29.60 | 29.97 | −.07 | 44.7 | −1.1 | 53.8 | 35.6 | 72 | 18 | 2.70 | −.78 | T |
| Kingston, Ontario | 285 | 29.70 | 30.01 | −.03 | 46.6 | −1.8 | 56.4 | 36.7 | 71 | 18 | 2.64 | −.36 | .0 |
| Toronto, Ontario | 379 | 29.59 | 30.00 | −.06 | 50.1 | +1.7 | 57.2 | 42.9 | 76 | 29 | 1.89 | −.54 | T |
| Cochrane, Ontario | 930 | | | | 36.8 | −2.3 | 44.4 | 29.1 | 63 | 5 | 5.10 | +.48 | 5.5 |
| White River, Ontario | 1,244 | 28.58 | 29.94 | −.06 | 36.6 | −1.5 | 45.0 | 28.3 | 68 | 3 | 3.21 | +.64 | 7.0 |
| London, Ontario | 808 | 29.14 | 30.02 | | 49.6 | +1.4 | 59.0 | 40.2 | 76 | 24 | 3.31 | +.49 | T |
| Southampton, Ontario | 656 | 29.26 | 29.98 | −.05 | 49.0 | +1.0 | 58.1 | 39.8 | 77 | 28 | 4.19 | +.99 | .0 |
| Parry Sound, Ontario | 688 | 29.28 | 29.98 | −.05 | 46.2 | .0 | 53.9 | 38.4 | 77 | 20 | 3.68 | −.32 | 1.4 |
| Port Arthur, Ontario | 644 | 29.20 | 29.92 | −.08 | 39.4 | −2.4 | 47.5 | 31.2 | 64 | 14 | 2.32 | −.13 | 2.3 |
| Winnipeg, Manitoba | 760 | 29.08 | 29.95 | −.06 | 36.8 | −4.3 | 44.5 | 29.1 | 63 | 15 | .32 | −1.16 | .1 |
| Minnedosa, Manitoba | 1,690 | 29.12 | 29.97 | −.02 | 35.2 | −5.0 | 44.0 | 26.4 | 64 | 8 | .60 | −.50 | 1.7 |
| Le Pas, Manitoba | 860 | 28.97 | 29.97 | +.04 | 29.6 | −4.5 | 38.2 | 20.9 | 58 | −11 | 1.15 | +.05 | .9 |
| Qu'Appelle, Saskatchewan | 2,115 | | | | 35.0 | −4.2 | 46.7 | 25.4 | 71 | 4 | 1.02 | −.11 | 5.2 |
| Moose Jaw, Saskatchewan | 1,759 | | | | 38.6 | −2.6 | 49.7 | 27.5 | 74 | 1 | .77 | −.04 | 6.5 |
| Swift Current, Saskatchewewan | 2,392 | 27.15 | 30.01 | +.01 | 37.1 | −4.9 | 48.0 | 26.3 | 71 | −5 | .93 | +.13 | 6.0 |
| Medicine Hat, Alberta | 2,365 | 27.47 | 30.00 | +.03 | 41.0 | −4.3 | 53.1 | 28.8 | 72 | −5 | .86 | +.27 | 2.2 |
| Calgary, Alberta | 3,540 | | | | | | | | | | | | |
| Banff, Alberta | 4,521 | | | | | | | | | | | | |
| Prince Albert, Saskatchewan | 1,450 | 28.38 | 29.97 | −.01 | 34.2 | −4.4 | 42.5 | 26.0 | 66 | 0 | .66 | −.19 | 5.3 |
| Battleford, Saskatchewan | 1,592 | | | | | | | | | | | | |
| Edmonton, Alberta | 2,150 | 27.58 | 29.97 | | 34.2 | −6.6 | 43.2 | 25.2 | 62 | −13 | 1.73 | +1.02 | 13.0 |
| Kamloops, British Columbia | 1,262 | | | | | | | | | | | | |
| Victoria, British Columbia | 230 | 29.84 | 30.09 | +.05 | 51.4 | +1.0 | 56.8 | 46.0 | 67 | 35 | 3.31 | +.59 | .0 |
| Barkerville, British Columbia | 4,180 | | | | | | | | | | | | |
| Estevan Point, British Columbia | 20 | | | | | | | | | | | | |
| Prince Rupert, British Columbia | 170 | | | | | | | | | | | | |
| St. George's, Bermuda | 158 | | | | | | | | | | | | |
| **LATE REPORTS FOR SEPTEMBER 1939** | | | | | | | | | | | | | |
| Quebec, Quebec | 296 | 29.66 | 29.98 | −0.04 | 55.8 | +0.2 | 63.4 | 48.2 | 87 | 32 | 5.26 | +1.24 | 0.0 |
| Banff, Alberta | 4,521 | | | | 49.6 | +2.6 | 60.8 | 38.3 | 78 | 26 | 3.01 | +1.28 | .0 |

TABLE 4.—*Severe local storms, October 1939*

[Compiled by Mary O. Souder from reports submitted by Weather Bureau Officials]

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

| Place | Date | Time | Width of path, yards | Loss of life | Value of property destroyed | Character of storm | Remarks |
|---|---|---|---|---|---|---|---|
| Council Bluffs, Iowa | 4 | 6 p. m. | | | | Thunderstorm and wind. | Lightning struck an electric substation; wires down; trees uprooted. |
| Emmet County, Iowa | 4 | 7:50 p. m. | | 0 | $55,000 | Tornado | Buildings on 3 farms wrecked or badly damaged with lesser damage occurring on about 12 other farms; 1 person injured. Loss in crops, mostly corn. Storm of short duration and path narrow. |
| Garnett, Kans., and vicinity | 4 | 10 p. m. | 20 | 0 | 5,500 | do | Originated about 2 miles southwest of Garnett and passed through the northeastern portion of the city with little damage. Near the city an airplane hangar and 2 planes were destroyed and several farm buildings damaged; path 8 miles long. |
| Martin and Blue Earth Counties, Minn. | 4 | | | | 6,000 | Thundersqualls | In Mankato, where the greatest damage occurred, streets were flooded when 1.33 inches of rain was reported to have fallen in less than 20 minutes. Path about 70 miles long. |
| Sadler and Southmayde, Tex., vicinity of. | 5 | 9 p. m. | [1] 2 | | 8,000 | Wind and hail | Property damage from wind, $7,000; crop loss from hail, $1,000. |
| Fort Stockton, Tex | 8 | 1:30 p. m. | 880 | | 5,000 | Hail | Loss to crops; property damage not estimated. |
| Crane, Tex | 8 | 3:15 p. m. | [1] 2 | | 20,000 | Straight-line wind | Property damaged. |
| Escanaba, Mich | 8 | 4:45 a. m. | | | 12,500 | Hail | This is reported to have been the most severe hailstorm in the history of Escanaba. Property damage includes roofs, windows, awnings, signs, automobile tops, and windshields. |
| Houston, Tex | 20 | 11:20 a. m. | | | 50,000 | Wind | Property damaged. |
| Canton, N. Y | 22 | | | | 5,000 | Thunderstorm | Barn and contents destroyed. |
| Kirkland, Ill., vicinity of | 24 | | | | | Electrical | Large farm residence burned. |

[1] Miles instead of yards.

## LATE REPORT

### *Severe local storms, September 1939*

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Yearbook]

| Place | Date | Time | Width of path, yards | Loss of life | Value of property destroyed | Character of storm | Remarks |
|---|---|---|---|---|---|---|---|
| St. Marys and southern Calvert Counties, Md. | 10 | 3-4 p. m. | [1] 8 | | $50,000 | Heavy hail | Much loss in tobacco and other late crops; path 25 miles long in St. Marys County. |
| Farmington, Ark., vicinity of | 29 | A. m. | | | 2,000 | Thunderstorm | Barn and contents destroyed by fire. |
| Keyser Ridge and Grantsville, Md. | 29 | 2:45-3 p. m. | [1] 3 | | 7,500 | Hail | Roofs and automobile tops damaged; windows broken; loss in apple crop; path 6 miles long. |
| Camden, Ark. | 29 | 6 p. m. | | | 1,500 | Thundersquall | Property damaged. |
| El Dorado, Ark. | 29 | P. m. | | | 1,000 | Thunderstorm | Do. |
| Piggott, Ark., vicinity of | 29 | do. | | | 800 | do. | Livestock killed. |
| Scott, Ark., vicinity of | 29 | do. | | | 600 | do. | Do. |
| Hagerstown, Md., and vicinity. | 29 | | | | 6,000 | Electrical | Property damaged. |

[1] Miles instead of yards.

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U. S. GOVERNMENT PRINTING OFFICE: 1940

Chart I.—Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, October 1939

## Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, October 1939

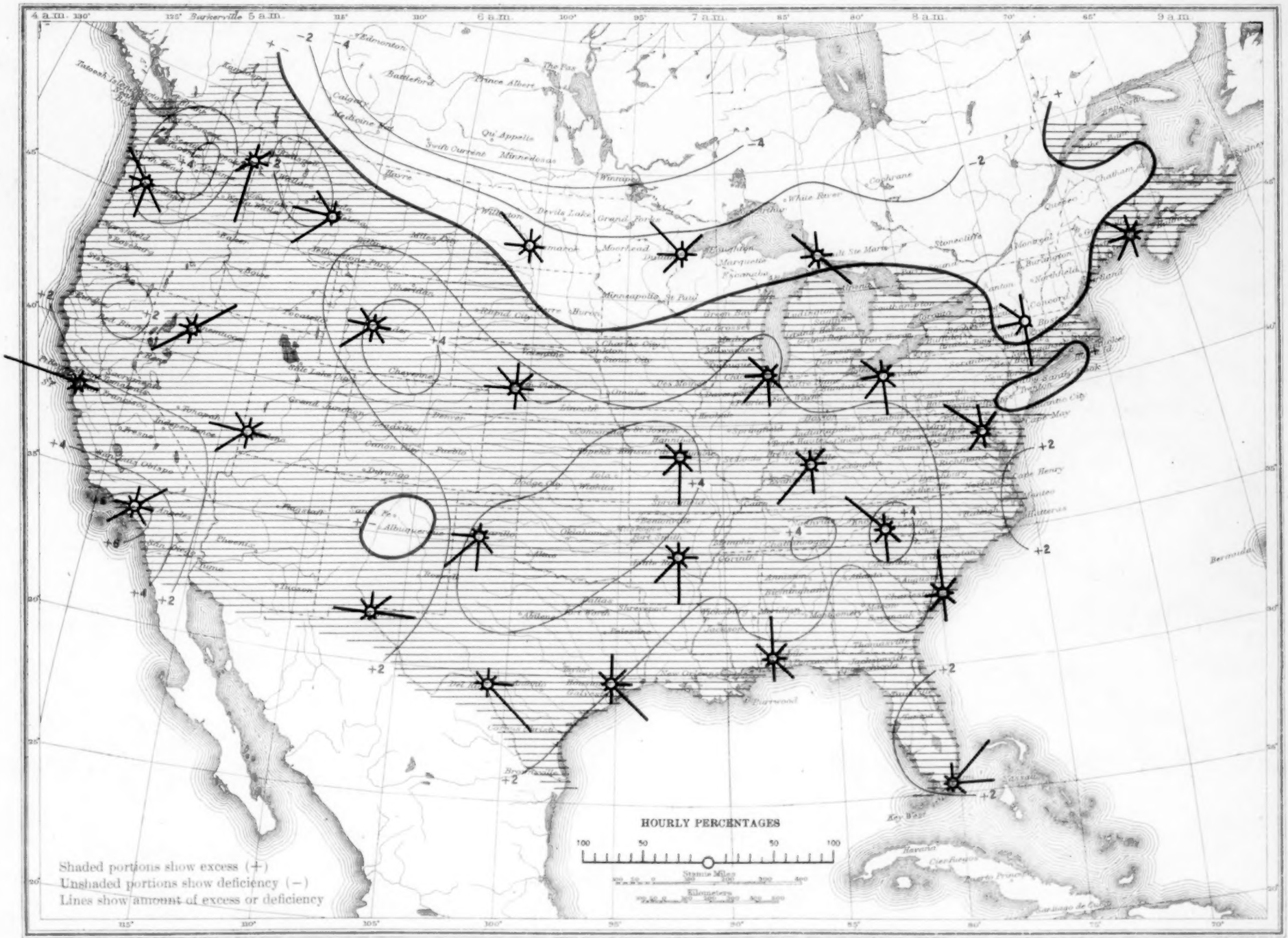
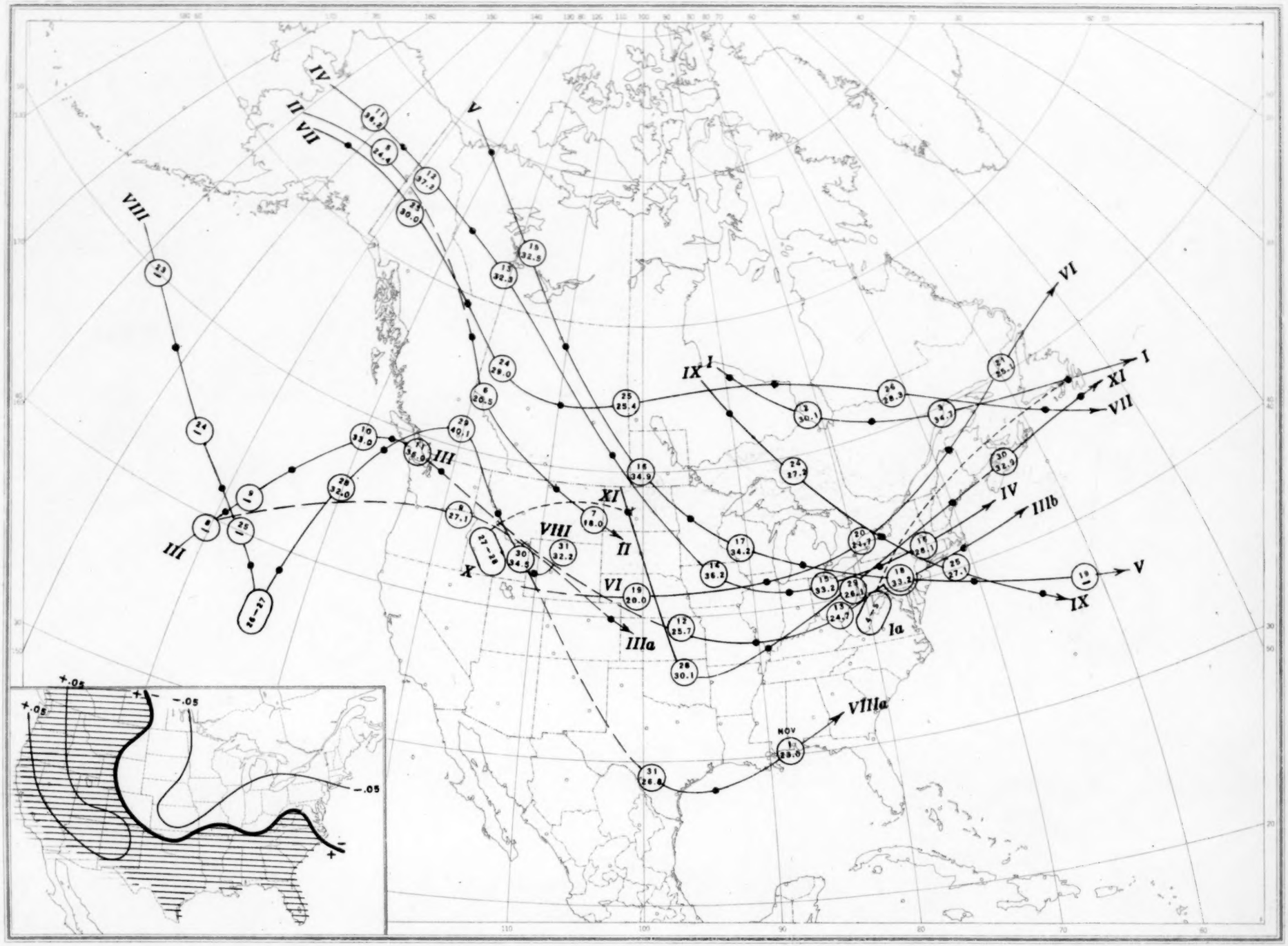
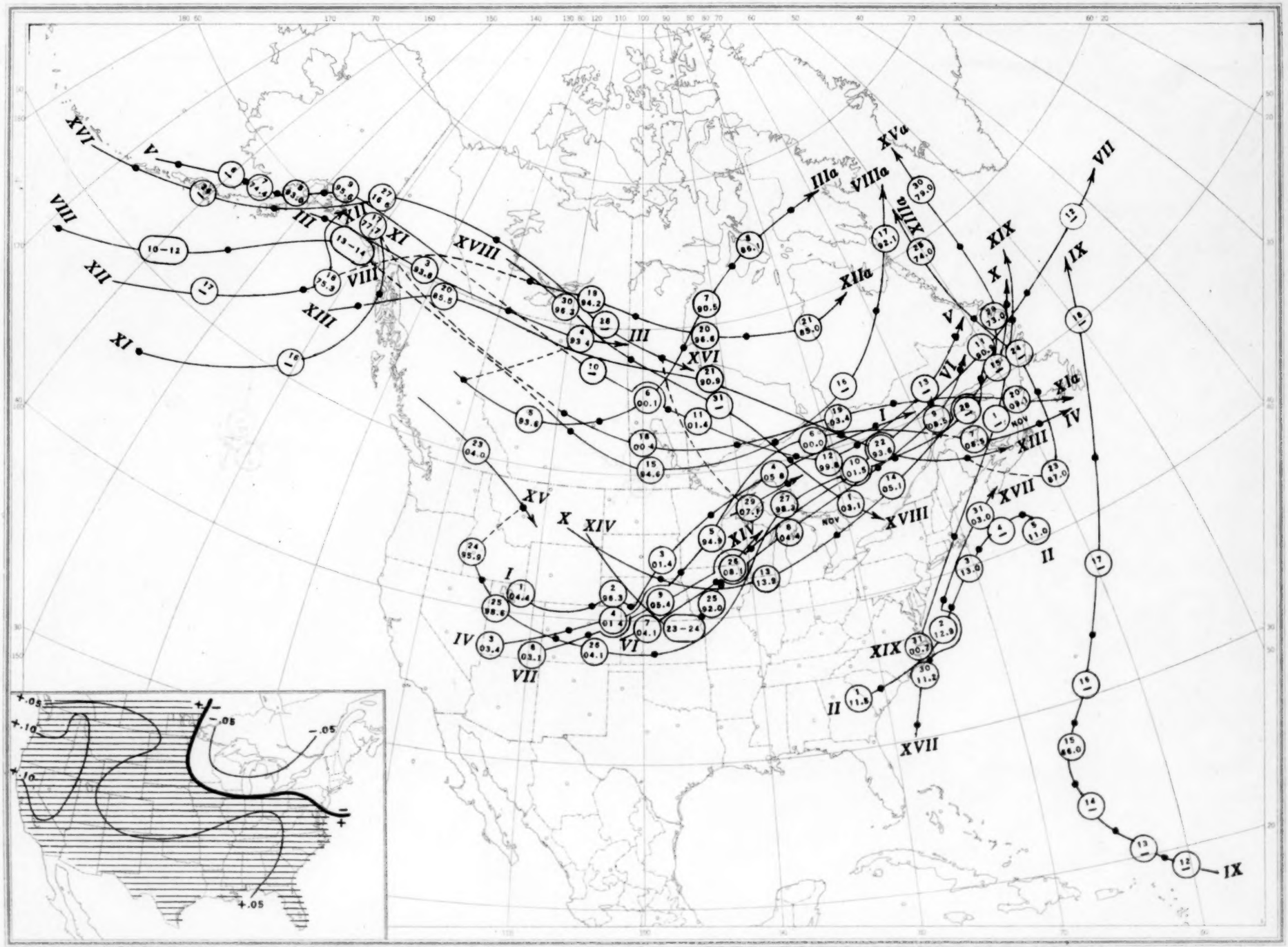


**Chart II. Tracks of Centers of Anticyclones, October 1939.** (Inset) **Departure of Monthly Mean Pressure from Normal**



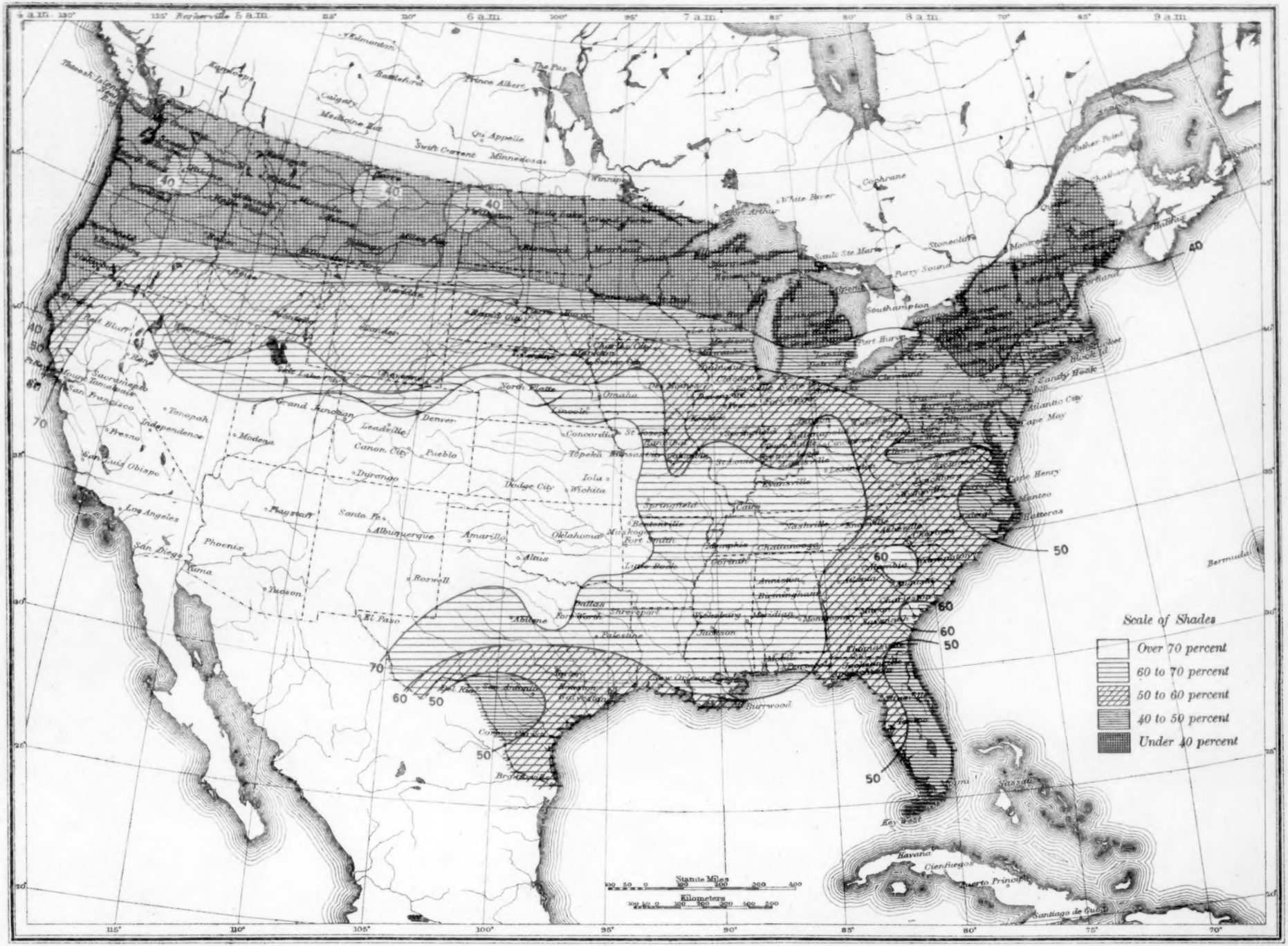

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

**Chart III. Tracks of Centers of Cyclones, October 1939.** (Inset) **Change in Mean Pressure from Preceding Month**




Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

## Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, October 1939






## Chart V. Total Precipitation, Inches, October 1939. (Inset) Departure of Precipitation from Normal

**Chart V. Total Precipitation, Inches, October 1939.** (Inset) **Departure of Precipitation from Normal**

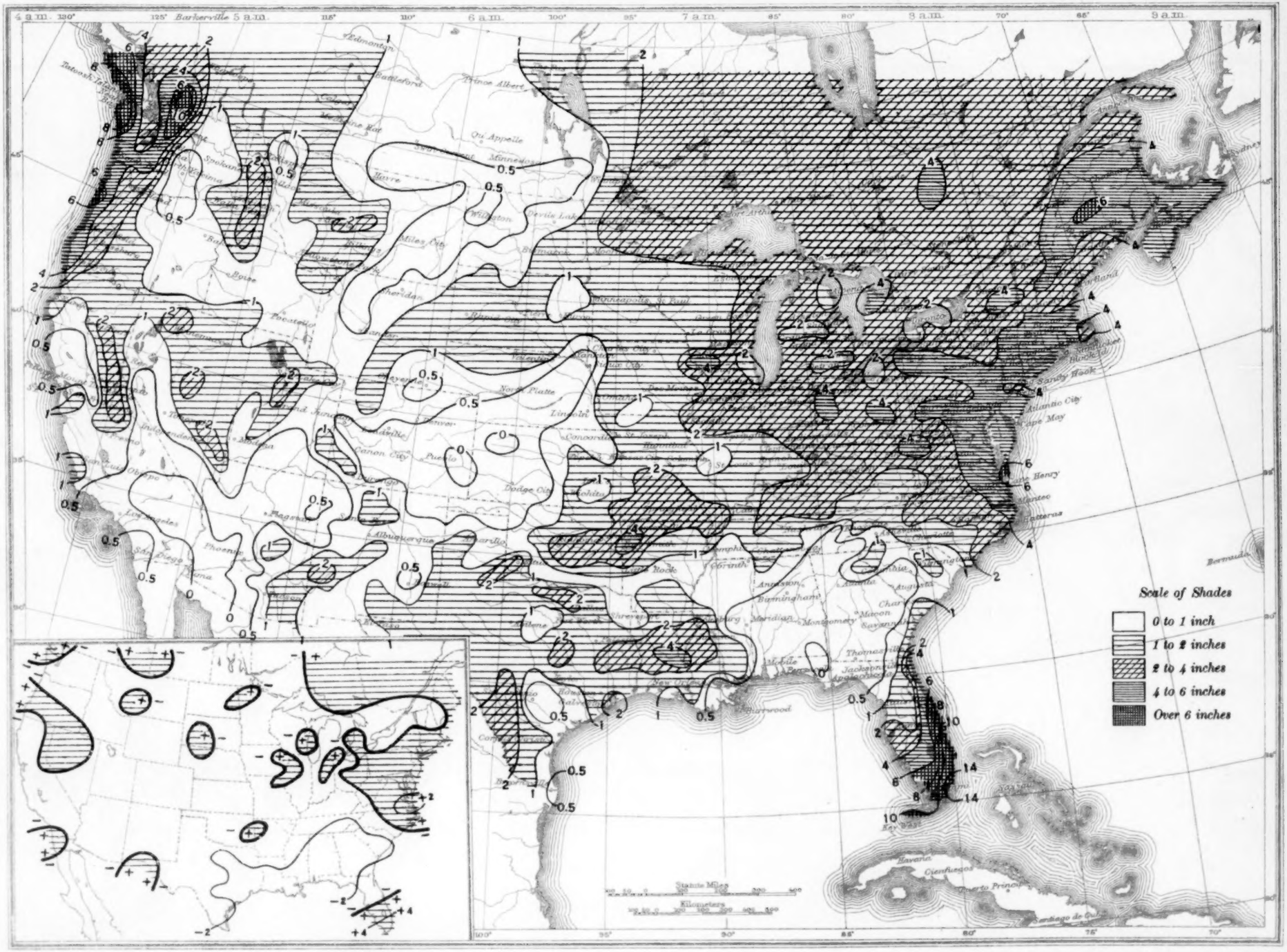


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, October 1939

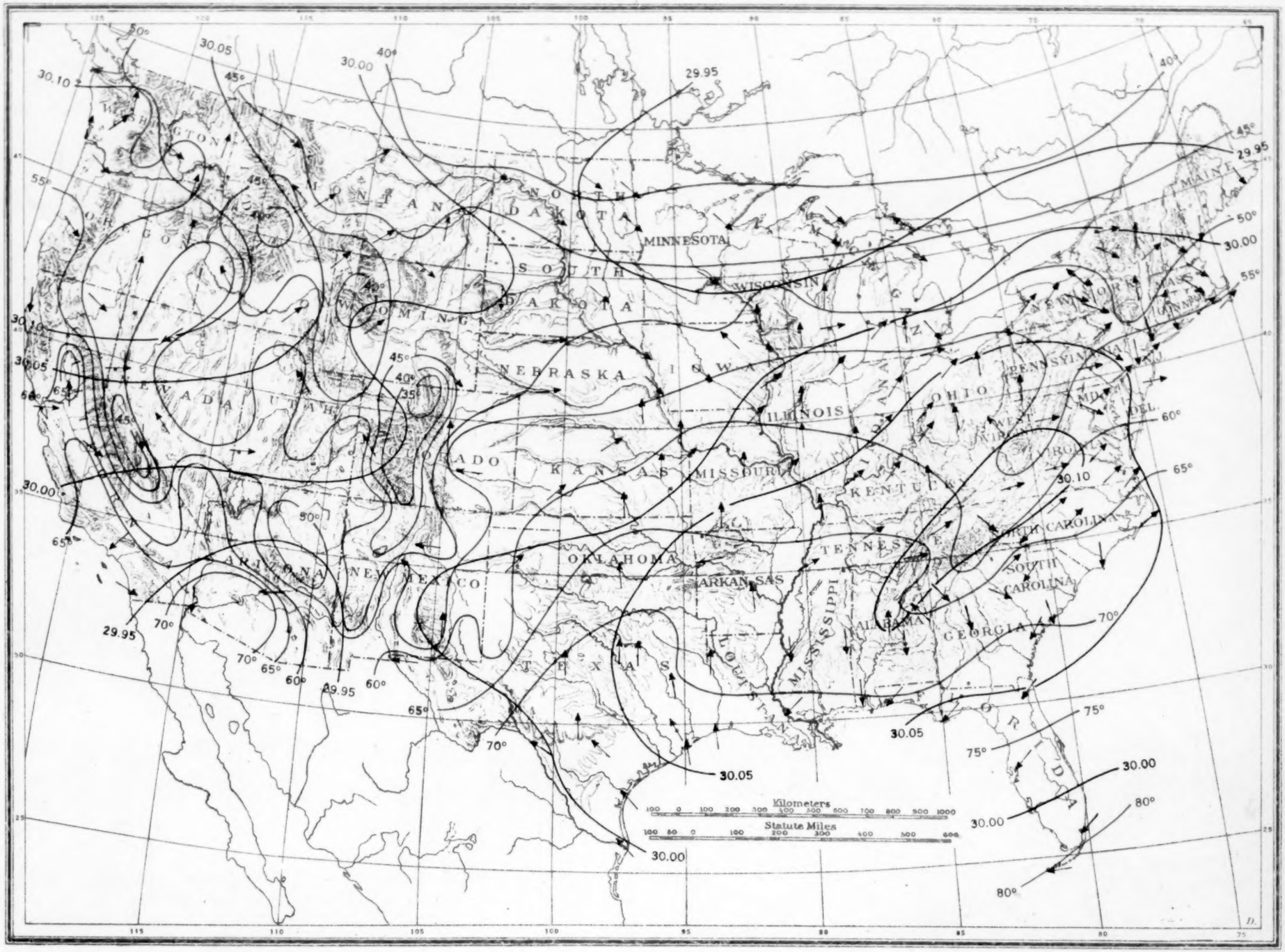





Chart VII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) October 1939

**Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) October 1939**

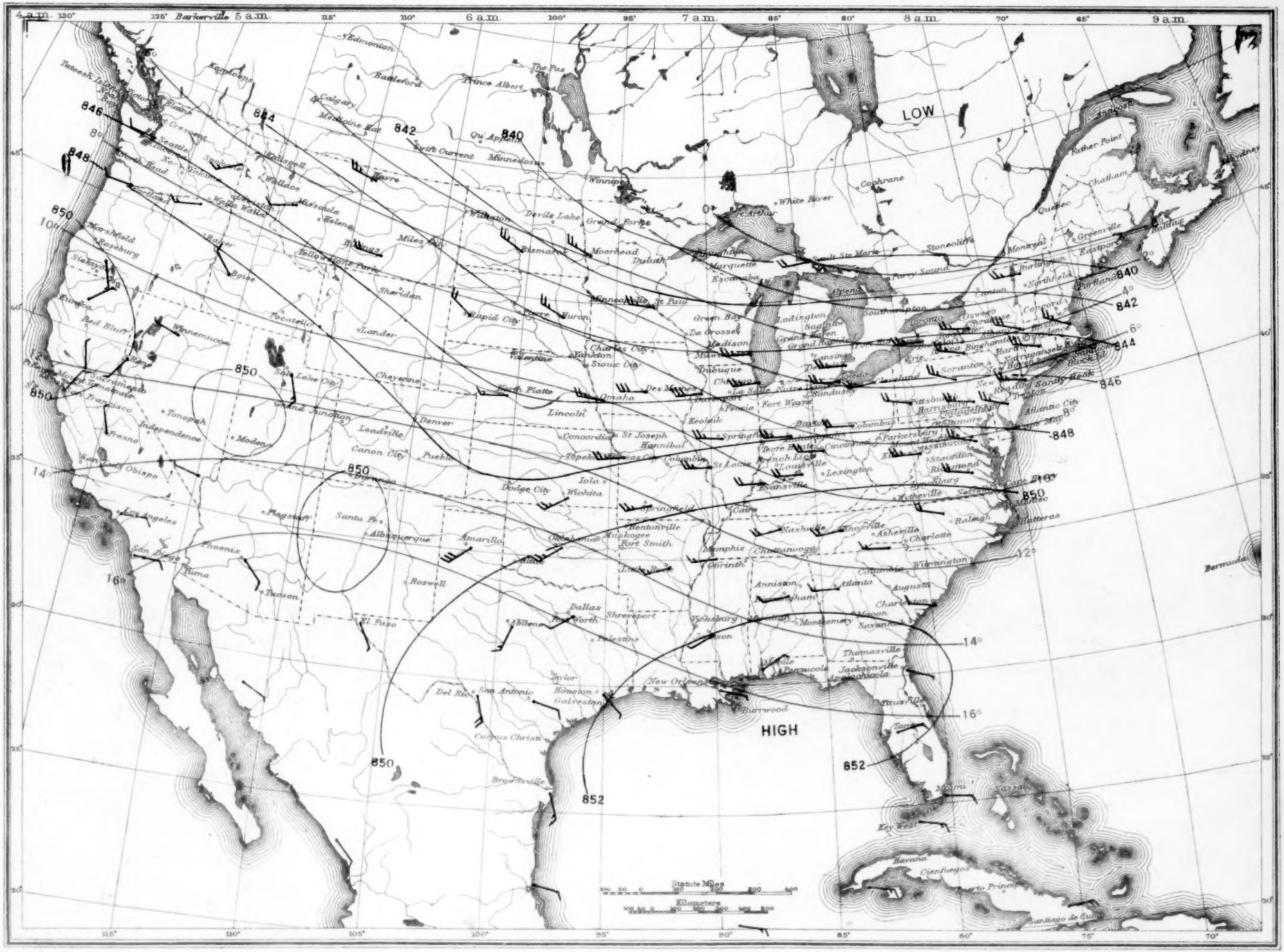


Chart IX. Isobars (mb) Isotherms (°C.) and Resultant Winds for 3,000 Meters (m. s. l.) October 1939

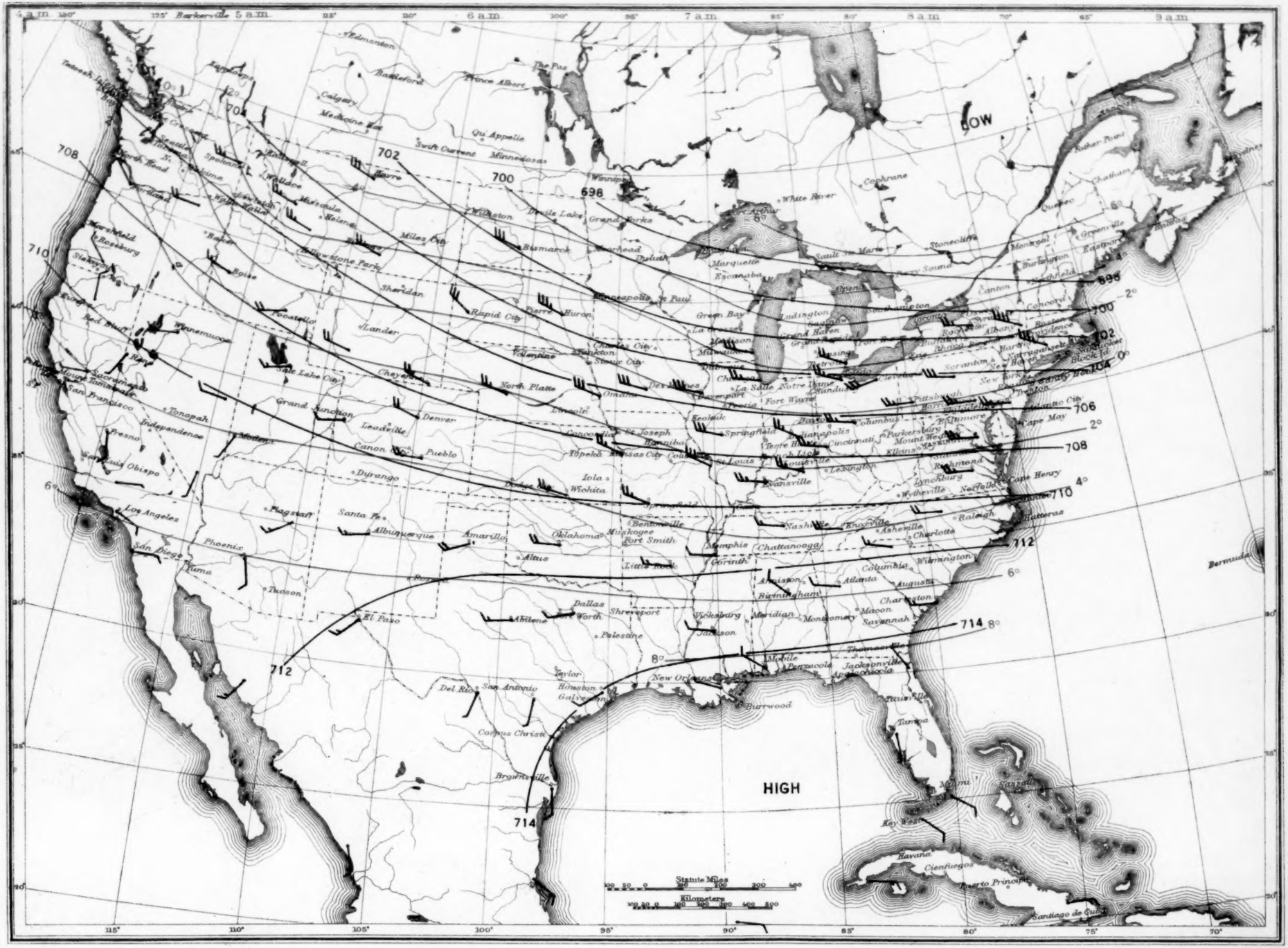
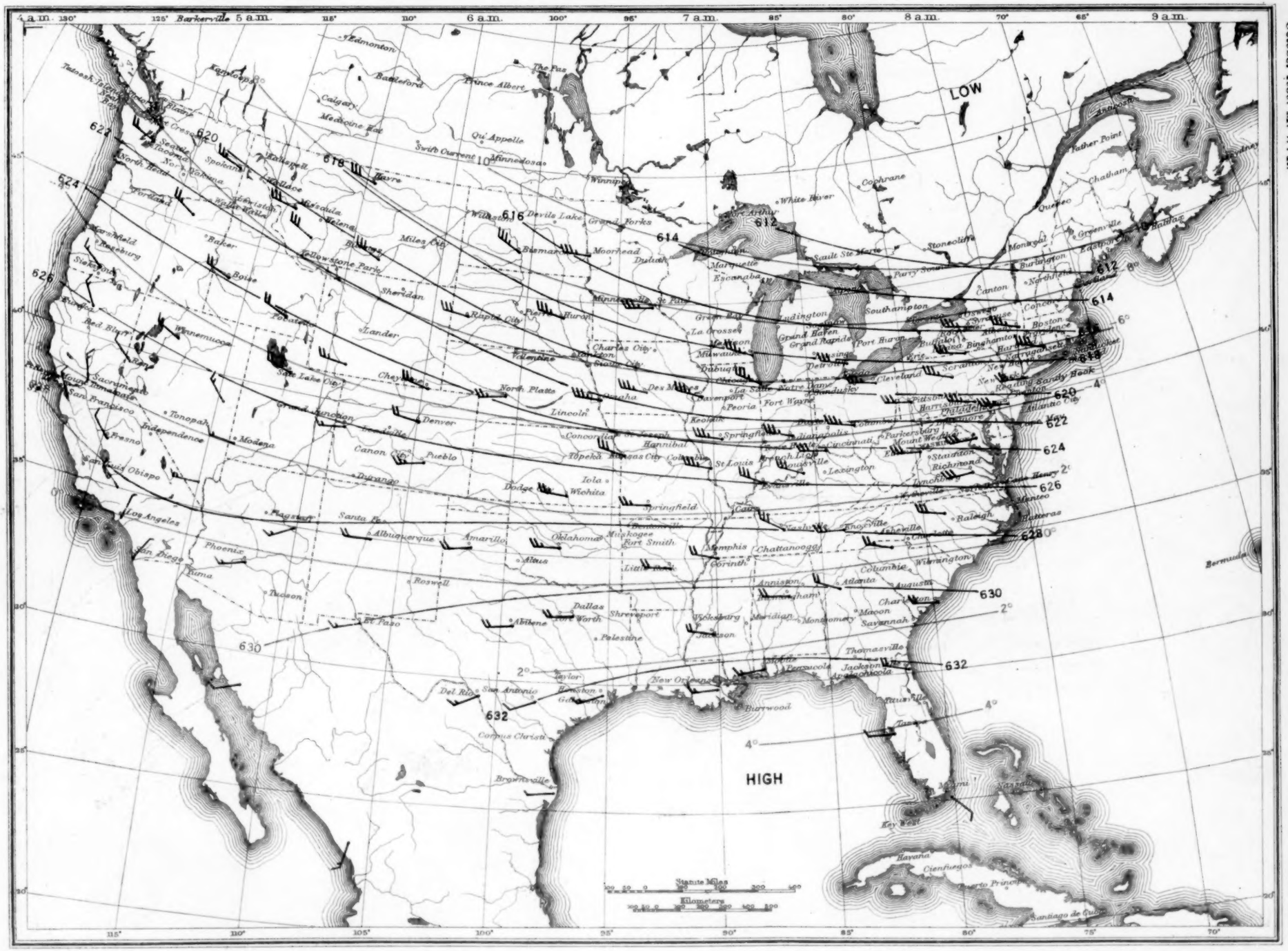




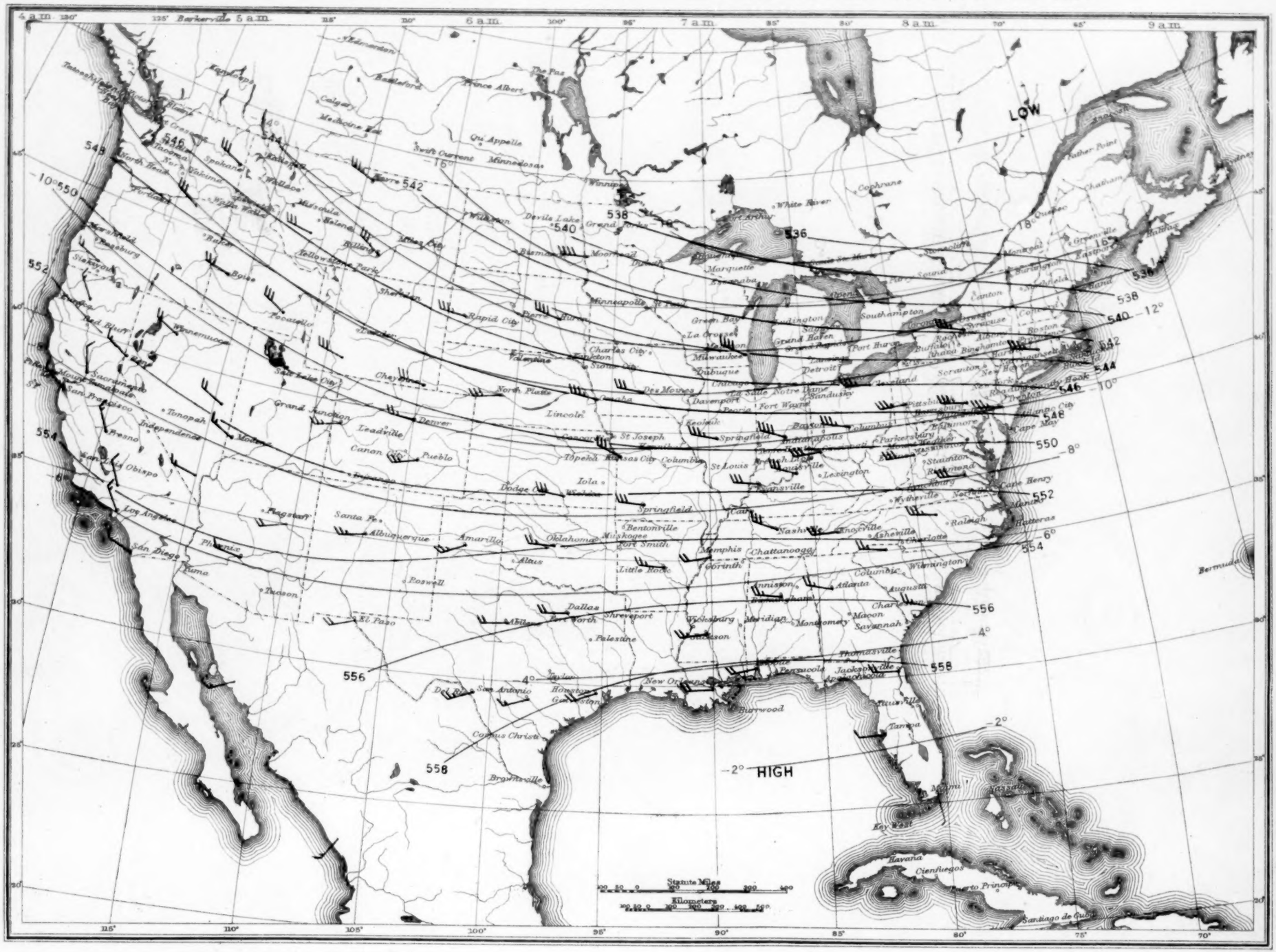



Chart X. Isobars (mb) Isotherms (°C.) and Resultant Winds for 4,000 Meters (m. s. l.) October 1939

## Chart X. Isobars (mb) Isotherms (°C.) and Resultant Winds for 4,000 Meters (m. s. l.) October 1939



## Chart XI. Isobars (mb) Isotherms (°C.) and Resultant Winds for 5,000 Meters (m. s. l.) October 1939



## Chart XII. Mean Isentropic Chart, October 1939 (Potential Temperature 312° A.)

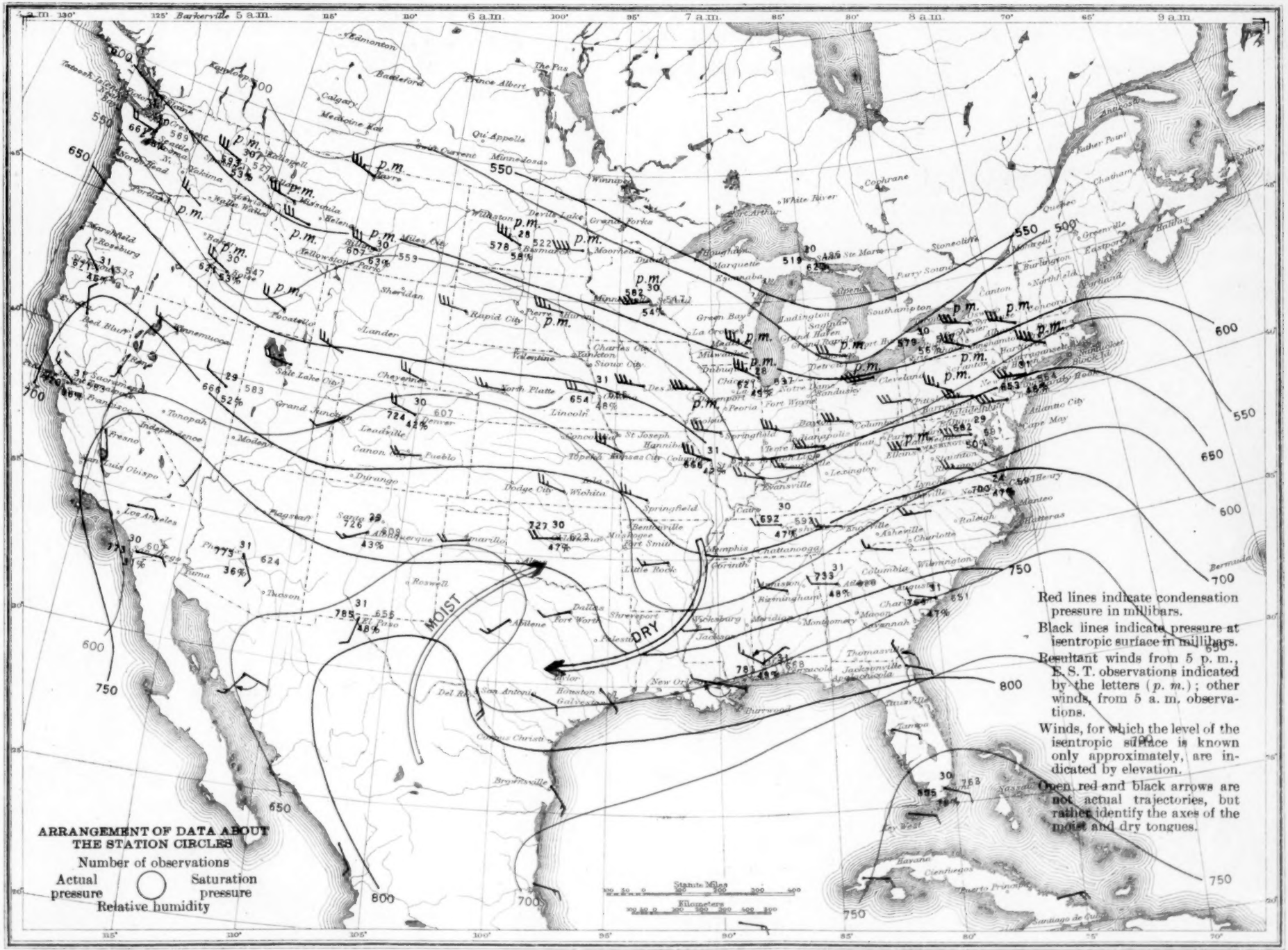


Chart VIII–a. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) July 1939

**Chart VIII-a. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) July 1939**

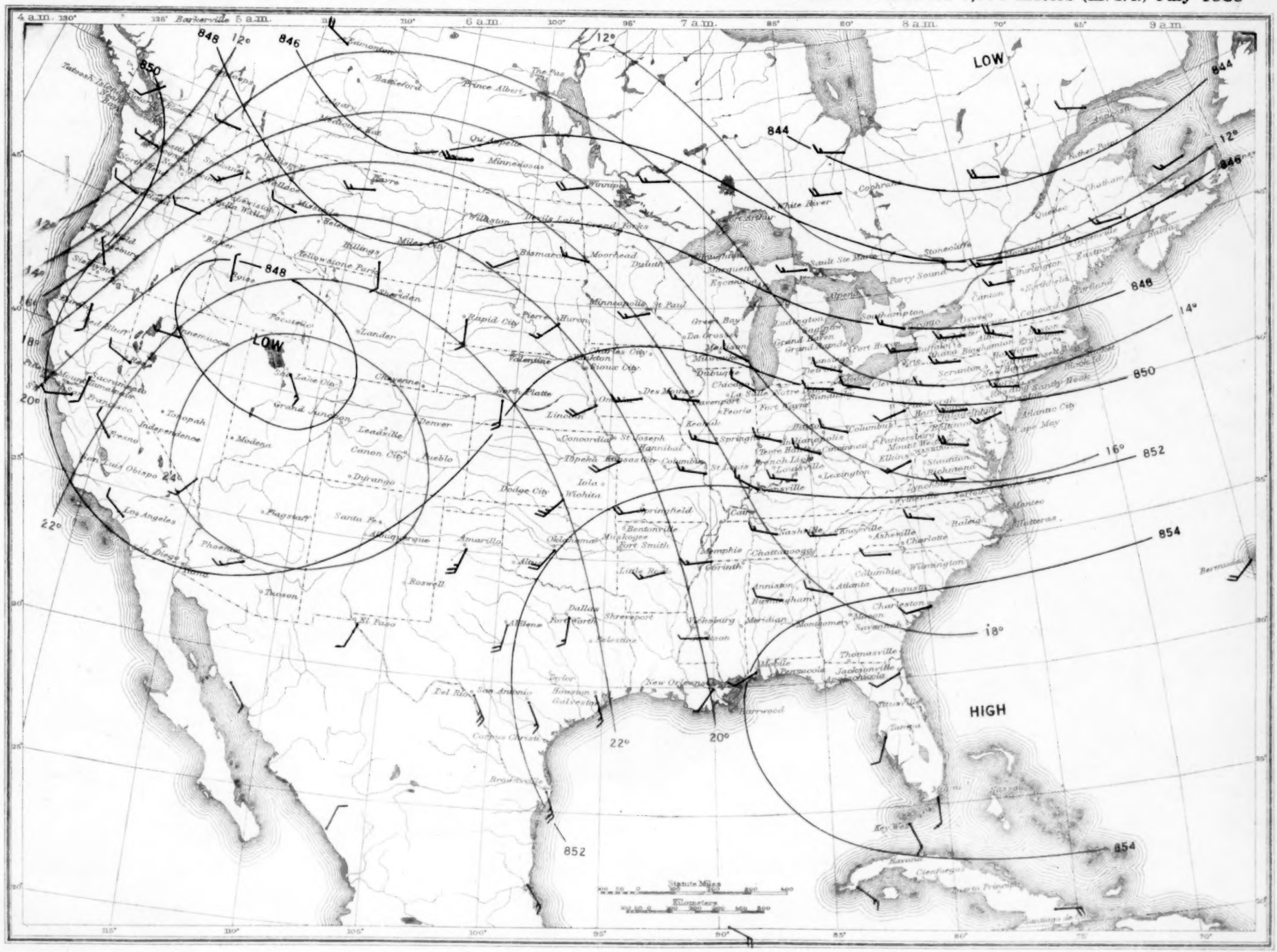
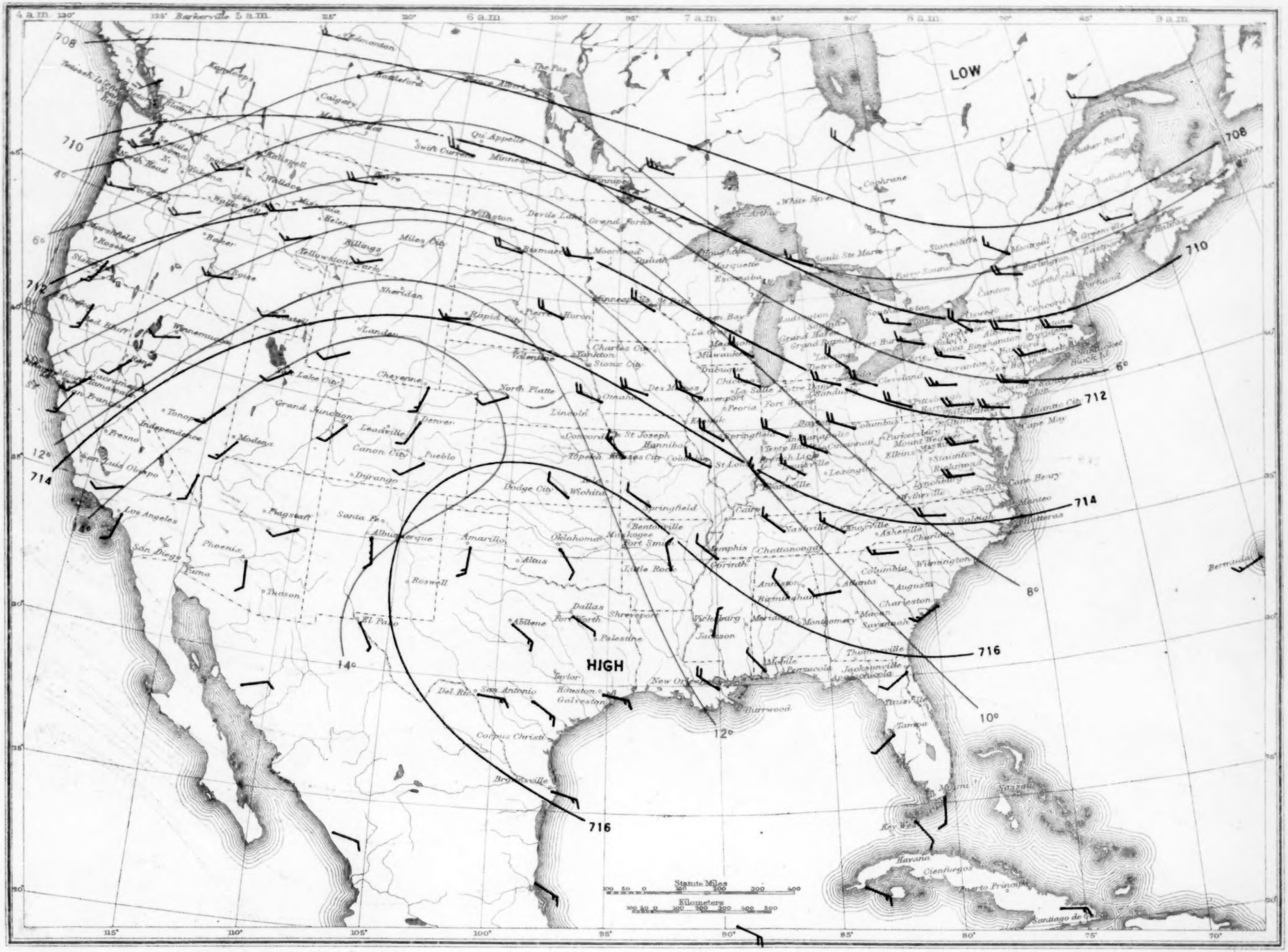


Chart IX-a. Isobars (mb) Isotherms (°C.) and Resultant Winds for 3,000 Meters (m. s. l.) July 1939



## Chart X-a. Isobars (mb) Isotherms (°C.) and Resultant Winds for 4,000 Meters (m. s. l.) July 1939

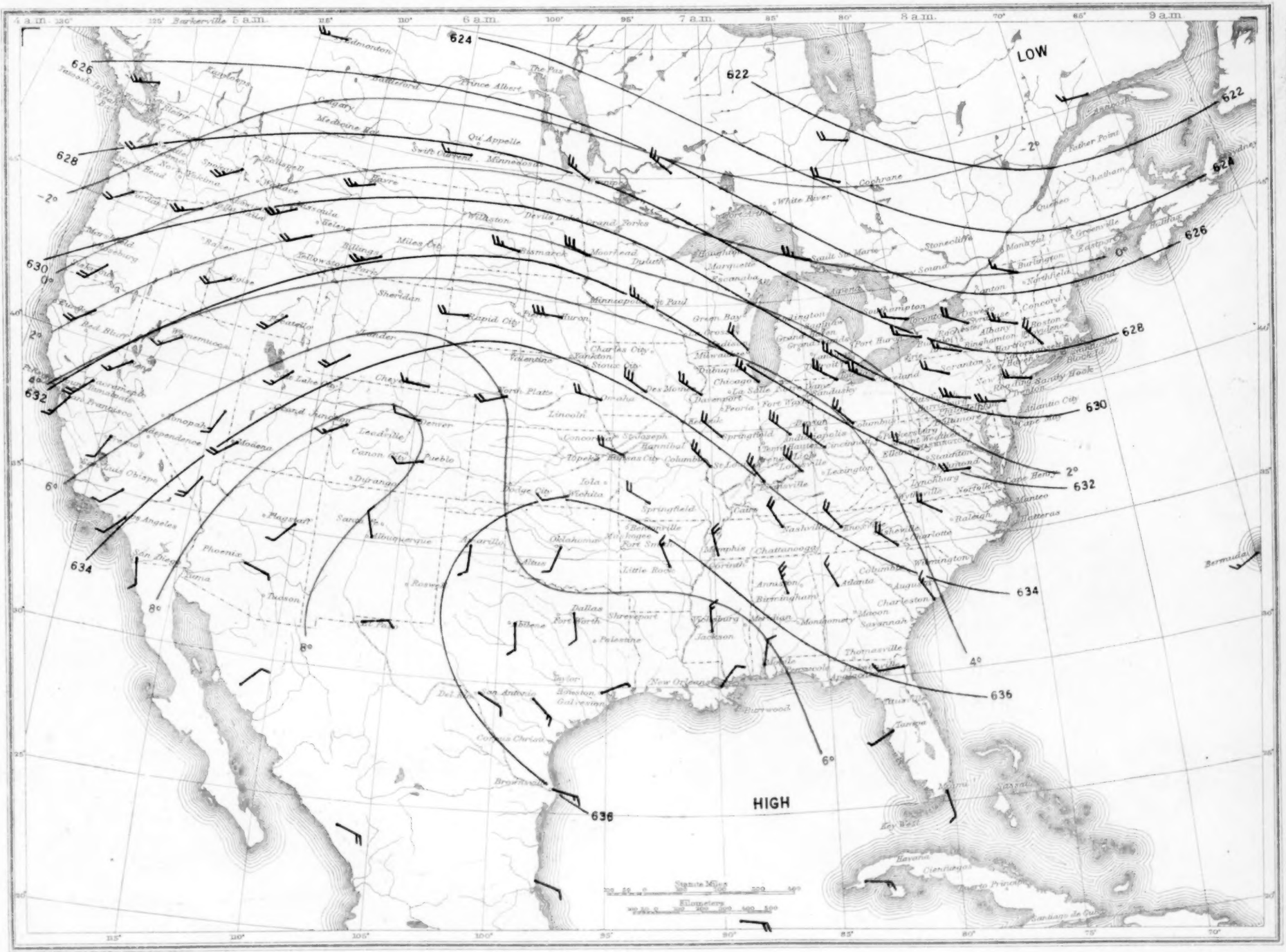
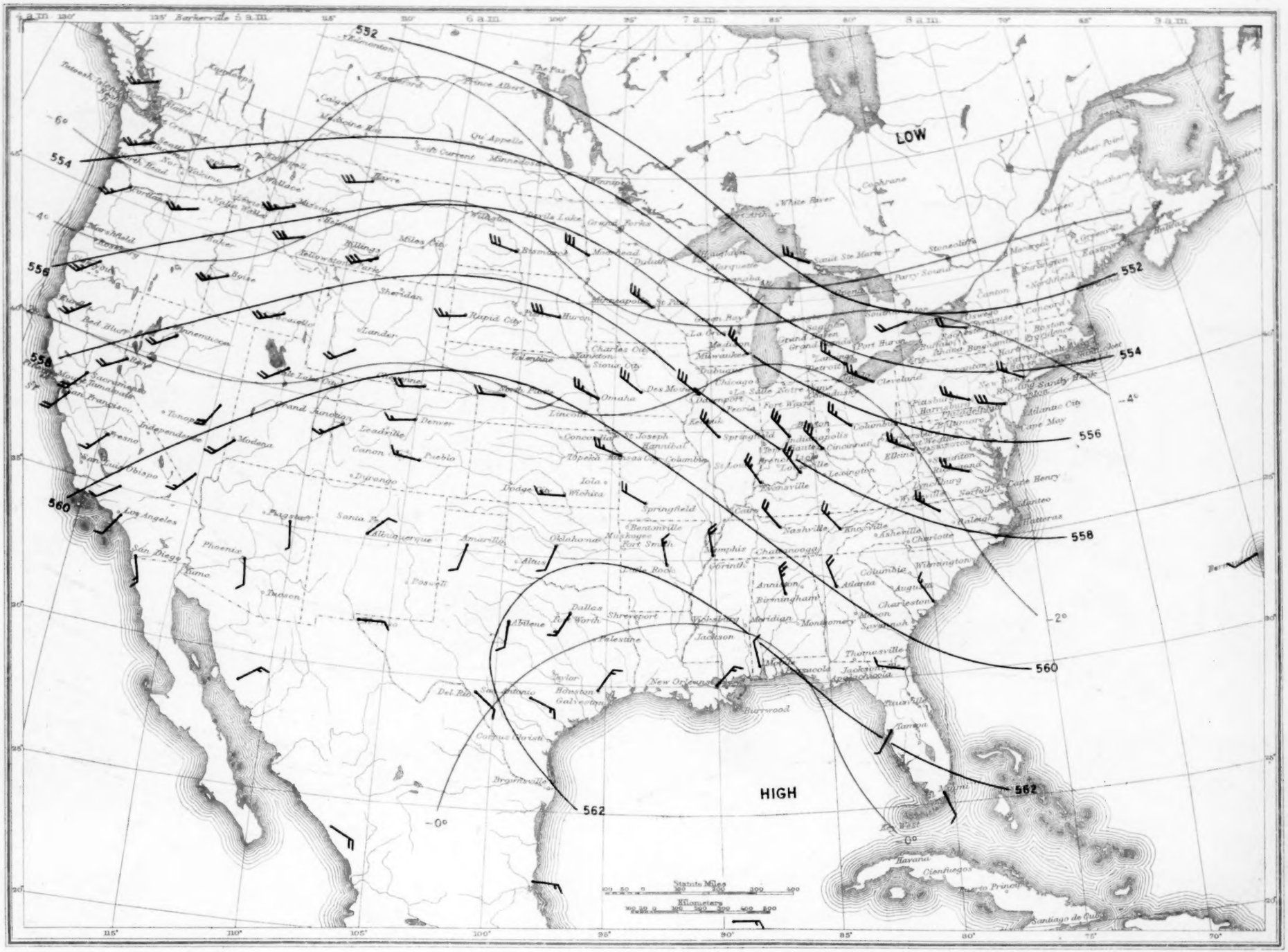


Chart XI-a. Isobars (mb) Isotherms (°C.) and Resultant Winds for 5,000 Meters (m. s. l.) July 1939



## Chart XII-a. Mean Isentropic Chart, July 1939 (Potential Temperature 315° A.)